Yukon
State of the Environment
Report 2002

Yukon
Environment

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This 2002 comprehensive State of the Environment Report is the latest full report on the environment since the 1999 report was published. Interim reports were provided in 2000 and 2001.

State of environment reporting provides early warning of potential problems in the environment, allows the public and government agencies to monitor progress on the objectives of the Environment Act and provides further baseline information.

This report is a compilation of data from a wide variety of sources and does not present original data. Although this report is not intended to make a policy statement, it is hoped that it will be useful for decision makers throughout the territory.

Input from Yukon citizens is incorporated into this document through the "community view" sections.

Many thanks to the scientists, technicians and local Yukoners, who provided information for this report.

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Introduction

Why produce a State of the Environment Report for the Yukon?

State of the Environment reporting is a requirement of the Yukon *Environment Act*. The report's purpose is to provide an early warning and analysis of potential problems for the environment; allow the public to monitor progress toward the achievement of the objectives of the *Environment Act* and to provide baseline information for environmental planning, assessment and regulation. State of the Environment Reports (SOEs) for the Yukon have been produced as follows:

- 1995 Yukon State of the Environment Report
- 1997 Yukon State of the Environment Interim Report: A focus on Air Quality and Climate Change
- 1999 Yukon State of the Environment Report
- 2000 Yukon State of the Environment Interim Report
- 2001 Yukon State of the Environment Interim Report

State of the Environment reporting is also occurring nationally and provincially. Yukon SOEs feature the format set out and used by the Government of Canada. This is namely to present a report that provides the responses to the following questions:

- What is happening in the environment?
- Why is it happening?
- Why is it significant?
- What is being done about it?

British Columbia, since 1998, has presented their SOEs in a bullet style format called Environmental trends. This also answers the above key questions. The Yukon first featured this format in its 2001 interim SOE. This format is carried on in this document. Your feedback to the format and/or content of this report is welcome and can be provided to the Government of Yukon through the evaluation form provided at the end of this document.

What is an indicator?

Indicators are key measurements that can be used to monitor, describe and interpret change. Indicators cannot provide all information on a particular topic, but can give key information that shows how things in the environment are doing. The indicators featured here are based on key criteria including data availability, data reliability, usefulness, and understandability.

How was this report developed?

This report represents a collective effort from scientific experts, government agencies, non-governmental organizations and coordinators, who have provided information, data and advice.

Yukon *Environment Act* Excerpts

Yukon State of the Environment Report

47. (1) The Government of Yukon shall report publicly on the state of the environment pursuant to this Act.

(2) The purpose of a report under subsection (1) is

(a) to provide early warning and analysis of potential problems for the environment.

(b) to allow the public to monitor progress toward the achievement of the objectives of this Act; and

(c) to provide baseline information for environmental planning, assessment and regulation.

Requirements for the Yukon State of the Environment Report

48. (1) The Minister shall prepare and submit to the Legislative Assembly a Yukon State of the Environment Report within three years of the date this section comes into force and thereafter within three years of the date of the previous report.

(2) The Yukon State of the Environment Report shall

(a) present baseline information on the environment;

(b) incorporate the traditional knowledge of Yukon First Nation members as it relates to the environment;

(c) establish indicators of impairment of or improvement to the environment and identify and present analyses of trends or changes in the indicators; and

(d) identify emerging problems for the environment, especially those involving long-term and cumulative effects.

(3) The Minister shall coordinate preparation of a Yukon State of the Environment Report with the preparation of a revision of the Yukon Conservation Strategy and, to the extent practicable, with state of the environment reporting of the Government of Canada, circumpolar nations, and jurisdictions adjoining the Yukon, and an audit under section 39.

Review by Council

49. The Council shall review a Yukon State of the Environment Report and submit a report of its review to the Legislative Assembly.

Interim Report

50. (1) Commencing from the date of the first Yukon State of the Environment Report, for every period of twelve consecutive months in which a Yukon State of the Environment Report is not made, the Minister shall prepare an interim report and submit it to the Legislative Assembly.

(2) An interim report under subsection (1) shall comment on matters contained in the previous Yukon State of the Environment Report.

A Community View Introduction

In past Yukon State of the Environment Reports (SOEs), traditional knowledge has been included through the presentation of elder's quotes within the various sections of the reports. The 2002 report features an innovative way of including the community perceptions of environmental change. The results of this telephone survey are called "A community view". This represents a pilot project to include Yukoners' environmental observations in the SOE.

This project collected, analyzed and presents community perceptions of recent environmental change in Yukon, comparing the years 1995-2000 to the years 2000-2002. This new approach is intended to achieve the following:

1. Changes in the environment may be discovered earlier than they would have otherwise.
2. Yukoners will actively participate in the process of reporting observations of environmental change, promoting increased awareness of the environment in terms of change.

Information was collected about certain environmental change indicators from people working in the field and a set of questions was developed to ask of selected members in the communities, who regularly spent time on the land from 1995 to 2002.

Students at Yukon College, studying Renewable Resource Management by distance education, participated as interviewers in Watson Lake, Whitehorse and Dawson City. Interviews were conducted in person where possible, otherwise by phone. Between three and five people were interviewed in each community.

This unique addition to the 2002 Yukon SOE was not meant to be a statistically-sound survey but rather a way to include community perceptions from those close to the land.

Highlights

Air and Atmosphere

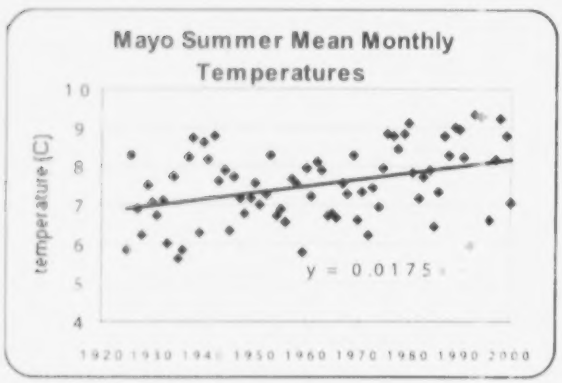
The air in the Yukon is cleaner than in southern cities. However, episodes of high ambient air pollution occur occasionally in residential areas throughout the Yukon, mostly due to residential wood smoke pollution. In downtown Whitehorse, there has been a downward trend of ambient carbon monoxide levels since 1984, when monitoring began.

Depletion rates of the Arctic ozone layer have been as high as 45 percent since 1980. Globally the production of a primary ozone-depleting substance, chlorofluorocarbons (CFCs) declined by 88 percent between 1988 and 1997, as a result of international phase outs of CFC products. However, full recovery of the ozone layer is expected to take 50 years or more.

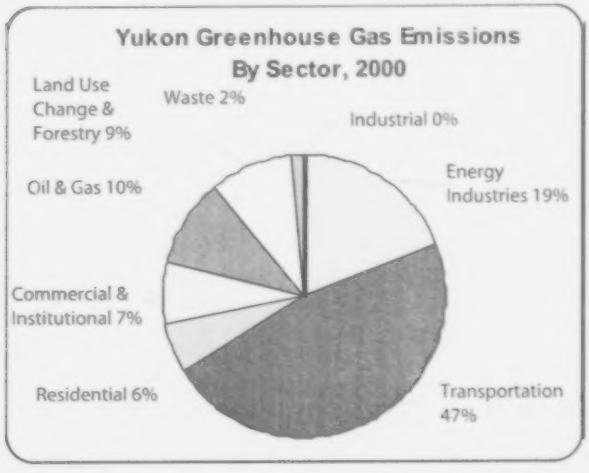
Climate Change

The Government of Canada ratified the Kyoto Protocol to the United Nations Framework Convention on Climate Change in December 2002. The Northern Climate ExChange (NCE) opened in February 2000 at the Northern Research Institute, Yukon College, in response to growing concern over the impacts of climate change on the land, life, and communities of northern Canada.

Globally, nine of the ten warmest years have occurred since 1990. All of the Yukon communities measured, except for Watson Lake and Whitehorse in the summer, show increases in mean monthly summer, winter and annual temperatures over the period of record (between 40 and 100 years). Over the course of the last century the average spring break-up date of the Yukon River at Dawson City has advanced by six days.



While total Yukon emissions of greenhouse gases account for 0.07 per cent of total Canadian emissions, per capita Yukon people produce emissions at just below the Canadian average. The most significant sector is transportation, which accounts for 47 percent of total Yukon greenhouse gas emissions.



Water

Reports provided annually by public water system owners indicate that community drinking water quality is generally within the accepted Yukon health-related standards. The Yukon Communicable Disease Control reports that there have been no diseases or illnesses or any documented waterborne outbreaks attributable to public water sources or systems during this State of the Environment reporting period (1999-2002).

In general, Yukon baseline monitoring studies have shown surface water quality to be good. Overall, sewage treatment facilities in Yukon communities are in good condition with a few exceptions. Water licenses have been issued, requiring the construction of a Sequencing Batch Reactor (SBR) mechanical treatment plant for Dawson City and a lagoon based system for Burwash Landing. Design and construction scheduling are underway. A water license application including preliminary design is being prepared for a mechanical treatment system in Carmacks. An infiltration and dispersal treatment facility has been approved for Carcross.

A study, jointly funded by DIAND, the Government of Yukon and the City of Whitehorse, resulted in the development of a groundwater database, which will be maintained by the Yukon's Water Resources Branch, Department of Environment.

Land

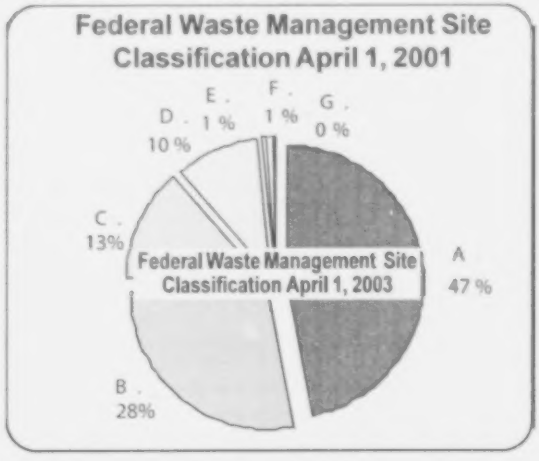
Protected Areas

Management planning for five special management areas under First Nation Final Agreements was initiated during this SOE reporting period (1999 - 2002).

Waste: Solid, Special, Recyclables and Compost

As a result of the first eight months (May to December 2002) of the City of Whitehorse's city-wide curbside compost collection program, 34 percent of total residential waste has been diverted from the Whitehorse landfill. Since 1994, through the special (*hazardous*) waste collection program, the Government of Yukon has collected and treated 290 tonnes of special waste. In 2002 alone, more than 47 tonnes of special waste were collected.

In order to establish a higher, more uniform standard of operation, solid waste management plans for all solid waste facilities in the Yukon are required, under the *Environment Act*. Research is being completed to determine the costs and benefits of a system of community transfer stations, using central landfill site(s) in the Yukon.



Legend

A. Remediated (426)
B. Remediation not required (257)
C. Assessment required (121)
D. Remediation required (87)
E. "Type I" site (6)
F. "Type II" sites (7)
G. Contained sites (25-150 year warranty) (3)

Contaminated Sites

The source of contamination for the majority of Yukon sites is fuel (petroleum-hydrocarbon). The cause can be leaky tanks, or spills during fuel transfer (e.g. fill lines) or transport. Other contaminant sources include heavy metals from ore handling, lead paint, asbestos, or even concentrations of road salt.

Amendments to the Contaminated Sites Regulation, under the Yukon's *Environment Act*, were made in 2002 to allow for the use of risk-based standards and to require permits for land treatment facilities.

Under the Indian and Northern Affairs Canada (DIAND) Waste Management Program, 907 abandoned, potentially contaminated sites have been identified to date in the Yukon. The sites have been divided into seven categories according to the type of remediation or further assessment required. The federal government has allocated $ 2 million per year for 10 years for site assessment and remediation.

On Commissioner's Land, Transport Canada, as part of the airport transfer agreement is assessing and remediating a number of small hydrocarbon-contaminated sites at the Whitehorse and Watson Lake Airports.

Mining

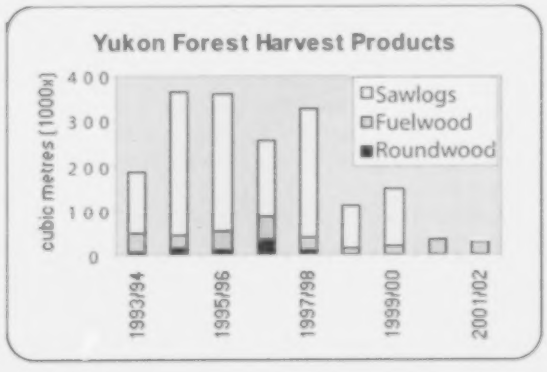
Since 1998 the number of active quartz and placer claims have declined 35 and 28 percent respectively. Placer gold availability is decreasing as reserves in traditional placer mining areas are becoming more difficult to find. In 1998 the Mining Environment Research Group (MERG) formed with a goal to promote research into mining and environmental issues in the Yukon.

Forestry

Approximately 60 percent of the Yukon is covered by forest. Of this area, less than 25 percent is capable of producing economical timber. The primary marketable species are white spruce and lodgepole pine.

Timber harvesting increased significantly in the early 1990s, peaked in 1994/95 and tapered off in 1999 as demand dropped and permitting was reduced by DIAND.

Responsibility for forestry will be transferred from DIAND to the Government of Yukon on April 1, 2003. In this new role, the Government of Yukon has committed to the development of new forestry legislation to replace the federal Timber Regulations.



Agriculture

An estimated 118 sq km (1.8 percent of Yukon's 6,680 sq km of arable land) has been disposed of, for agriculture. Gross agriculture sales in 2000 totalled $4,194, 864, representing a 19 percent increase from 1996.

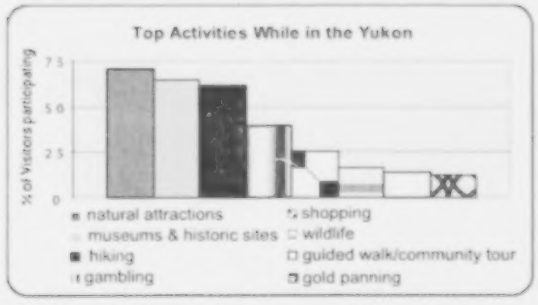
Although more agriculture land is estimated to be used for farm purposes now than in 1999, under-utilization is still a significant problem. With more regional-scale land use planning, cumulative impacts from agriculture and land use thresholds can be assessed and monitored.

Tourism

A strong component of Yukon's tourism trade continues to be concentrated along major transportation routes. The demand for accessible and safe wilderness viewing sites and educational centres, such as Swan Haven and Dempster Interpretive Centres, is increasing.

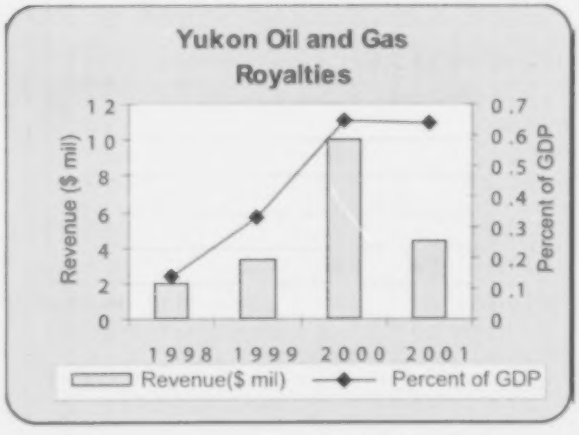
New niche markets, that include learning-based, winter and extreme wilderness adventure travel, are being actively developed in the Yukon. Off-road wilderness travel is increasing in the summer and seems to be increasing in the winter.

Yukon tourism strategies, developed with industry partners target high yield, as opposed to high volume markets, which allows for a manageable increase in tourism numbers. As tourism markets change, different types of environmental impacts will have to be anticipated and managed.



Oil and Gas

Oil and gas royalties tripled between 1999 and 2000 but have not yet exceeded one percent of Yukon's Gross Domestic Product (GDP).



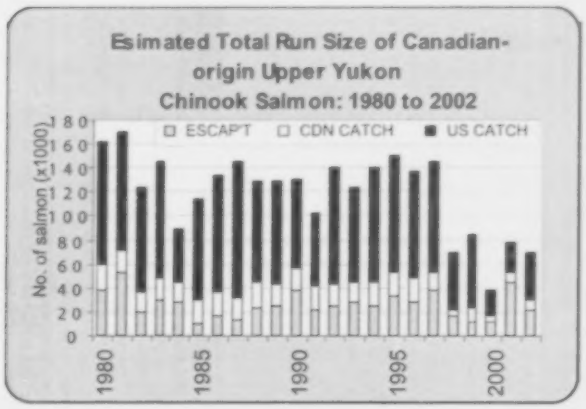
Yukon's gas reserves are estimated to be more than 20 trillion cubic feet. Oil reserves are estimated at over 900 million barrels. However, Yukon's oil and gas basins remain relatively unexplored. Global demand, the future construction of a major gas pipeline in the north, completion of outstanding land claims and promotion of Yukon's resource potential will all have an impact on the timing and extent of the development of Yukon's oil and gas resources.

The Yukon's oil and gas regime has been developed with a goal to minimize environmental risks including requiring industry to: apply for a licence and complete an environmental assessment of all oil and gas activity; provide a financial deposit for abandonment and reclamation work and; negotiate a Benefits Agreement for training, employment and business opportunities.

Fish and Wildlife

Salmon

Overall, the number of Yukon salmon returning to their spawning grounds (escapement return) is declining, except for some species in the Alsek River basin. Fisheries biologists speculate that ocean conditions (poor marine survival) may have an influence on the recent declining salmon numbers.



Yukon chinook salmon may be the first wild population of pacific salmon documented to have a fungal parasite, *Ichthyophonus*. The parasite causes a change in the flesh, which renders some fish unmarketable. An expanded study of the management and conservation implications of *Ichthyophonus* is underway.

The Canada-US Yukon River Salmon Treaty was signed on December 4, 2002 to rebuild and conserve Canadian-origin salmon stocks.

Freshwater Fish

In the Yukon, there are commercial, domestic and First Nation subsistence food fisheries along with sport or recreational angling. Sport fishing accounts for the vast majority of the freshwater fish harvested.

The number of licensed anglers in the Yukon has been slightly declining this decade but numbers are relatively stable in comparison with some Canadian provinces, where interest in fishing has declined dramatically. According to the five-year recreational fishing survey, last completed in 2000, anglers are using live release techniques more now than five years ago. Baseline information has been established on fish stocks in approximately 70 lakes in the Yukon.

Birds

Based on the limited surveys completed there are no indications of significant trends in Yukon's waterfowl numbers. The Gyrfalcon is the largest species of falcon and breeds in Arctic and sub-Arctic regions, including the Yukon. The Yukon's Coast Range Gyrfalcon population dynamics appear normal, with the young population following the 10-year population cycles of their main food source, ptarmigan. During low ptarmigan years Gyrfalcons do not breed or may abandon nests. Bird Studies Canada initiated the BC-Yukon Nocturnal Owl Survey in 2000 to monitor long-term trends in owl populations.

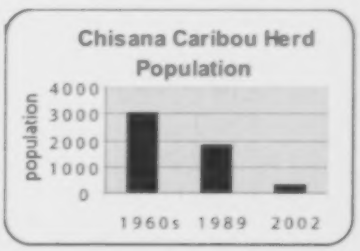
Furbearers

Overall furbearer populations are stable. The annual fur harvest has been low since the early 1990s, and decreased even further between 1997/98 and 2001/02. The economic, social and cultural value of trapping is significant as it provides a winter revenue source in smaller communities when unemployment is traditionally high.

Caribou

The woodland and barrenground caribou ranges are distributed throughout the Yukon. The status of the herd populations vary.

In October 2002, for the first time in 50 years, caribou from the Fortymile caribou herd migrated across the Yukon River, following its historical migration route. The return of the Fortymile herd from near-extirpation is a reflection of the effectiveness of management efforts.



Without intervention, the woodland Chisana caribou herd could be in danger of extirpation. A pilot captive breeding project for the herd is expected to begin early in 2003.

Biologists believe that the recent declining trend of the Porcupine caribou herd is related to weather conditions such as high snow accumulations and shorter summers that are causing an increase in adult mortality.

Moose

Overall, moose populations are stable or increasing. The areas where moose populations are declining are generally more easily accessible by hunters and/or closer to larger populated areas.

Moose are widely distributed throughout the territory. However, their numbers tend to be concentrated in shrub habitat near creeks and marshes, which make up a small portion of the Yukon. Although their numbers are healthy, habitat protection is still critical.

Grizzly Bears

About 30 percent of the Canada's grizzly bears live in the Yukon. Globally, grizzly bear habitat has been reduced by approximately 50 percent. Grizzly bear habitat has not historically been monitored in the Yukon but as a result of a decrease in human population since 1997, habitat pressures are unlikely in the short-term.

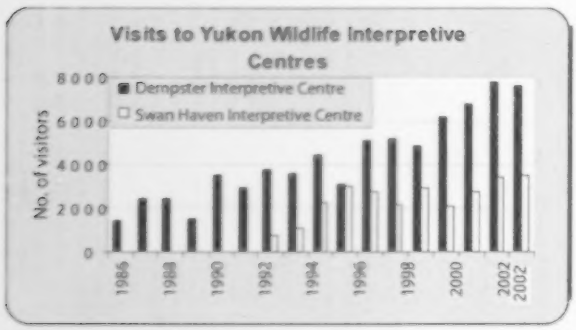
Thinhorn Sheep

Sheep are believed to be at, or near, historical population levels and have re-colonized some ranges where they had previously disappeared (probably due to over-hunting). The population is considered stable, with short term fluctuations.

There is growing evidence that population trends occur roughly in 10-year cycles and may be related to Pacific climate cycles known as the *Pacific Decadal Oscillation*. Winter weather, in particular snow conditions, affects the birth rate. Weather during lambing in May affects lamb survival.

Wildlife Values

Thirty-nine percent of Yukon visitors and 28 percent of Yukon people participate in wildlife viewing activities while 11 percent of Yukon people participate in hunting activities.



The number of resident hunting licences sold has been steadily decreasing and non-resident hunting licences increasing since 1982.

The number of visits to the Dempster Interpretive Centre, at Tombstone Park, has increased by a factor of 5 since 1986.

Species at Risk

The federal government assented to Canada's *Species at Risk Act (SARA)* on December 12, 2002.

In the Yukon 13 species at risk have been identified by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Both populations of the Trumpeter Swans (Pacific Coast and Rocky Mountain) in northwestern Canada and Alaska are presently increasing at a healthy rate. The Tundra Peregrine Falcons are recovering from a period in 1982-87 when no breeding birds were found in the Yukon. In the 1970s Peregrine Falcons were judged to be in danger of extinction.

Ecosystems

Wetlands

Because the Yukon is a mountainous region, wetlands cover only 3 percent of the land base, a much smaller portion of the land base than many jurisdictions in Canada. In many parts of Canada there has been a substantial loss of wetlands as a result of drainage for urban expansion, agriculture and flooding by hydroelectric development. Comparatively, there have been fewer negative impacts on Yukon's wetlands.

Old Crow Flats, a large system of lakes and wetlands, provides habitat for peregrine falcons, songbirds, aquatic and terrestrial mammals and breeding and moulting grounds for a variety of waterfowl species. Between 1973 and 1999, there has been a 6.8 percent decline in the water surface area in Old Crow Flats.

Forests

The number of natural and human-caused fires, and hectares burned per year, has been increasing since the 1950s but to an even greater degree in the 1990s. The number of lightning-caused fires has been increasing faster than human-caused fires.

The forests affected by the *spruce bark beetle* in southwest Yukon increased from 22,600 hectares in 2001 to 69,415 hectares in 2002. The rate of infestation increased by more than 300 percent and the cumulative area of infestation now exceeds 250,000 hectares. A number of projects, such as the Canadian Forest Service's Forest Health Assessment, are being carried out to better understand the impact on forest ecology as a result of the spruce bark beetle infestations.

Chapter 1 Air and Atmosphere

1.1 AMBIENT AIR QUALITY

What is happening?

- In partnership with Environment Canada, and as part of the National Air Pollution Surveillance (NAPS) network, the Government of Yukon monitors: *carbon monoxide; nitrogen oxides; ground level ozone;* and *particulate matter.* These and other air pollutants are monitored nation-wide because of their contribution to Canada's *ambient air pollution*.
- The air in the Yukon is cleaner than in southern cities because there are fewer industrial activities and smaller, dispersed populations. However, episodes of high ambient air pollution occur occasionally in residential areas throughout the Yukon, primarily because of residential wood smoke pollution.
- In downtown Whitehorse, there has been a downward trend in ambient CO levels since 1984. CO levels rarely exceed National Ambient Air Quality Objective categories.
- The *National Ambient Air Quality Objectives (NAAQOs)* set the maximum desirable and acceptable levels of CO and NO_x. The *Canada-wide Standards* set acceptable levels for fine PM and O_3. These are voluntary standards recommended for achievement by 2010.

The air in the Yukon is cleaner than in southern cities. However, episodes of high ambient air pollution occur occasionally in residential areas throughout the Yukon, mostly due to residential wood smoke pollution.

Community View

- Most people asked perceived a reduction in wood smoke from heaters in houses in Whitehorse/Laberge and Carcross/Tagish areas.
- Of those interviewed in Mayo most said there was an increase in wood smoke.
- Most people asked in six other communities, observed no change.
- A majority of the people interviewed in seven communities agreed that the amount of wood burned for heat and cooking has not changed. However, most people interviewed in Pelly thought that there was more wood burned.

Why is it happening?

- All ambient air pollutants tend to vary seasonally and geographically. Pollutants can come from:
  - point sources – such as community diesel generators or burning of solid waste (see also 4.2 Waste: Solid, Special, Recyclables and Compost);
  - area sources – such as residential and commercial oil and wood space heating;
  - mobile sources – such as vehicle exhaust; or
  - local or regional natural events like forest fires or windblown dust.
- Wood smoke episodes occur throughout the Yukon, often as a result of a combination of weather, topography, poor burning practices and inefficient woodstoves. For example, Whitehorse's Riverdale subdivision is on a valley floor where temperature inversions are more likely to trap wood smoke during cold weather.

What is it?

- Carbon monoxide (CO) is a gas produced primarily by the incomplete combustion of carbon-containing fuels from sources such as vehicles, woodstoves and furnaces.
- Nitrogen oxides (NO_x) are released during combustion of fossil fuels such as gasoline, diesel and heavy fuel oil.
- Unlike other pollutants, ground level ozone (O_3) is not emitted directly from human activities. It is generated by a photochemical reaction between ultraviolet light from the sun, NOx and volatile organic compounds (VOCs). Ground level ozone is the major component of photochemical smog.
- Particulate matter ($PM_{2.5}$) is comprised of a suite of pollutants that spans a range of sizes-coarse PM (diameter >2.5 micrometres (mm) and <10mm) and fine PM (diameter <2.5mm).
- Coarse PM primarily contains materials derived from the earth's crust, such as soil and mineral dust as well as pollen. Fine PM is classified as a toxic substance and is usually produced from human activities, such as fossil fuel combustion, road and construction sites as well as forest fires. Fine PM may contain sulphate, nitrate, ammonium, metals and hundreds of different organic compounds.

- The downward trend of carbon monoxide since 1984 in downtown Whitehorse is shown in Figure 1.1.1. It generally corresponds with a winter warming trend in Whitehorse.

Figure 1.1.1 Carbon Monoxide (CO) Levels in Downtown Whitehorse--1984 to 2001

Why is it significant?

- Based on Yukon's one NAPS monitoring station in downtown Whitehorse, CO levels, with only a few exceptions, are within national standards. However, episodes of local and regional poor air quality do occur. Natural events such as forest fires, cold winter days or windy spring days can amplify poor air quality caused by wood smoke, vehicle exhaust or dust.
- Fine PM can decrease visibility and harm human beings, especially infants, children, pregnant women and senior citizens. Particles can be deposited in the human respiratory system decreasing the lungs' ability to function.
- Ground level ozone (O_3) pollution is not expected to be a health issue in the Yukon because levels are low. At greater levels it not only affects human health, it can damage vegetation and decrease the productivity of some crops.

What is being done about it?

- The Government of Yukon operates the air monitoring station on First Avenue in downtown Whitehorse, as part of the NAPS program. This program is part of a network of air monitoring stations across Canada designed to monitor and assess, on a continuing basis, ambient air quality in urban regions of Canada.

Programs

- *Vehicle Emissions Clinic:* Hosted by Environment Canada in partnership with the Government of Yukon and the City of Whitehorse, this clinic provides free vehicle efficiency testing and pollution-reduction recommendations.
- *Commuter Challenge:* Held during National Environment Week, the Commuter Challenge is a friendly competition between Canadian cities to cut their air pollution through active modes of transportation. In 2002 the City of Whitehorse achieved the second highest per capita participation rate in Canada.
- *Clear the Air:* This annual advertising and educational campaign, sponsored by the City of Whitehorse and Government of Yukon, targets reduction of wood smoke and vehicle emissions.
- *Wood Heat Education:* Burn it Smart is a national wood heat education campaign sponsored by the federal government in partnership with provinces and territories, industry and non-governmental organizations. As part of this campaign, the Riverdale Woodstove Changeout Pilot Project, one of eight projects across Canada, was initiated in the fall of 2001. It helped educate homeowners and encouraged them to replace old, inefficient wood burning appliances with new high efficiency stoves. The Energy Solutions Centre continues to provide education about efficient wood heating.
- *National Air Pollution Surveillance Network (NAPS) Web Services:* In the near future, data from all NAPS stations will be available on-line in the Canada-Wide Air Quality Database. Publications and annual reports are available at http://www.etcentre.org/publications_e.html.

In downtown Whitehorse, there has been a downward trend of ambient CO levels since 1984.

1.2 STRATOSPHERIC OZONE

What is happening?

- Based on studies since 1980, scientists have determined that the stratospheric ozone layer, the only natural shield protecting the earth from the sun's intense ultraviolet rays, has been thinning over Canada and other parts of the globe.
- On average the global stratospheric ozone layer thinned by about three per cent between 1980 and 1991. In Canada, ozone depletion is usually greatest in the late winter and early spring. Depletion rates of the Arctic ozone layer have been as high as 45 percent and 100 percent in the Antarctic ozone layer, where massive holes have formed almost every spring since 1982.

Depletion rates of the Arctic ozone layer have been as high as 45 percent and 100 percent in the Antarctic ozone layer, where massive holes have formed almost every spring since 1982.

Why is it happening?

- Natural phenomena such as the oscillation of stratospheric winds, El Niño, the solar cycle as well as large volcanic eruptions will temporarily change the ozone layer thickness.
- However, scientists believe that the dramatic thinning in the ozone layer

since 1980 has primarily been caused by the manufacture and release of ozone-depleting substances (ODS). ODSs are made up of a range of chemical compounds including: chlorofluorocarbons (CFCs); hydrochlorofluorocarbons (HCFCs); bromofluorocarbons (halons); carbon tetrachloride, methyl chloroform and methyl bromide.

Full recovery of the ozone layer is expected to take 50 years or more.

- ODSs have been used, since the 1930s, in many applications including refrigeration, air conditioning, foams, solvents, pesticides and fire extinguishing equipment.
- Greater ozone losses over both the Arctic and Antarctic are the result of extremely cold winter winds that isolate the polar stratospheres and allow polar stratospheric clouds (PSCs), made up of ice, nitric acid, and sulphuric acid to form. These PSCs cause a series of chemical reactions that destroy stratospheric ozone far more effectively than the reactions that take place in warmer air.
- Scientists are in the early stages of studying the link between global warming and ozone depletion. Both processes may be causing changes in circulation patterns in both the stratosphere, where the ozone layer exists, and the troposphere, the earth's lower atmosphere. The net result of the changes and atmospheric interaction may be more cooling of the stratosphere. In turn, this may be causing widespread PSC formation resulting in increased ozone depletion and increased global warming of the troposphere (see also Chapter 2 Climate Change).

Why is it significant?

Globally, CFC production declined by 88 percent between 1988 and 1997 as a result of international phase outs of CFC products.

- Scientists predict that the ozone layer will continue to thin over the next 10 to 20 years while concentrations of ODSs released during past decades continue to build up in the stratosphere. Full recovery of the ozone layer is expected to take 50 years or more.
- Thinning of the ozone layer allows increases in concentrations of ultraviolet (UV) radiation to reach the earth's surface so that UV-related conditions such as sunburn, skin cancer, eye damage and suppression of the human immune system may become more prevalent.
- Increased UV exposure can affect animals in their early development processes and may inhibit the growth processes of almost all green plants such as crops or phytoplankton in marine environments.
- Some scientists have particular concerns about the effects on Arctic plants and animals. Having evolved in low-UV-level environments, they may be more sensitive to increased UV levels.

What is being done about it?

- The 1987 Montreal Protocol on Substances that Deplete the Ozone Layer has provided the foundation for a range of actions to mitigate ozone depletion. These actions include local and national-level legislation, education and training, changes in technology and voluntary actions by industry.
- Canada has eliminated or significantly reduced the production, import and export of ODSs. New supplies of ODSs fell from a high of 27.8 kilotonnes in 1987 to 0.9 kilotonnes in 1998.
- Globally, CFC production declined by 88 percent between 1988 and 1997 as a result of international phase outs of CFC products.
- Environment Canada operates 12 ozone monitoring stations across Canada and is targeting research to better understand the link between climate change and ozone depletion. They also host an ozone information website at http://www.ec.gc.ca/ozone/en/index.cfm and provide daily UV Index forecasts.
- The Government of Yukon passed regulations that govern the use and disposal of ODSs in 1996 and amended them in 2000 to include halocarbons. The resulting Ozone Depleting Substances and Other Halocarbons Regulation under the Environment Act provides for the harmonization of regulated pesticide activities with other governments.

Chapter 2 Climate Change

2.1 DRIVERS OF CLIMATE CHANGE

What is happening?

- In the early 1990s, the United Nations *Intergovernmental Panel on Climate Change* concluded that there is a discernible human influence on the global climate. While the study of climate change is an emerging and complex science, scientists continue to find new and stronger evidence that human activity is producing greenhouse gases in high enough concentrations to enhance the natural *greenhouse gas effect* and affect global climate changes.
- Greenhouse gases, such as carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O), have the ability to absorb infrared radiation in the atmosphere. Human actions can produce greenhouse gases (e.g. by burning fossil fuels) or reduce the ability of the earth to re-absorb carbon.

Figure 2.1.1 Yukon Greenhouse Gas Emissions By Sector, 2000

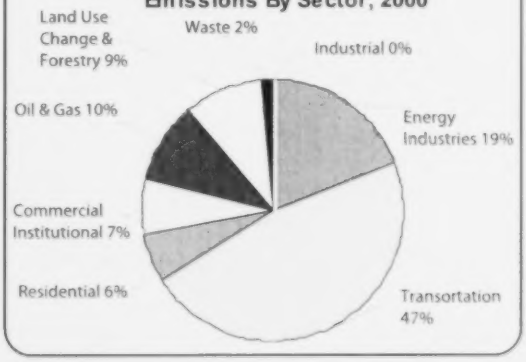
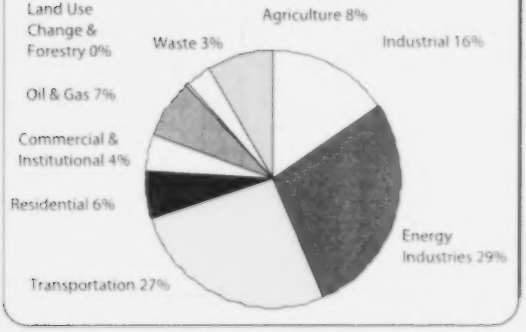
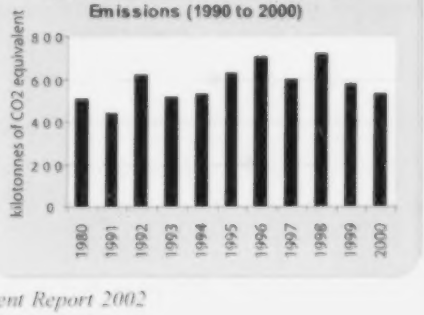


Figure 2.1.2 Canada Greenhouse Gas Emissions By Sector, 2000



- Figures 2.1.1 and 2.1.2 show where these human-produced emissions come from in the Yukon and across Canada, respectively. The data comes from Environment Canada's Greenhouse Gas Inventory (1990-2000). Some assumptions that are applied in more populated and industrial parts of Canada may not be the best fit for the Yukon. Nevertheless the data provides a general idea of Yukon's quantity and source of emissions.
- In 2000, Yukon produced a fraction—approximately 0.07percent—of Canada's total emissions. However, per capita, Yukon people produce emissions at just below the Canadian average.
- As shown in Figure 2.1.3 Yukon's total greenhouse gas emissions have fluctuated, between 420 and 720 kilotonnes of *carbon dioxide equivalent*, since 1990.
- The most significant sector in the Yukon is transportation, which accounts for 47 percent of the territory's emissions.
- Energy industries include electricity and heat generation as well as mining. This sector produces almost one third of Canada's and one fifth of Yukon's emissions. In 2001, 87.7 percent of Yukon's electricity production came from hydro sources, 11.9 percent from diesel generation and 0.4 percent from wind generation. With the Mayo-Dawson transmission line, diesel generation is anticipated to be reduced by 4.3 percent through the use of electricity from existing hydro facilities in Mayo.
- The industrial sector includes manufacturing, construction and industrial processes, which was negligible, on a large scale in the Yukon in 2000. Residential emissions are primarily generated from the burning of fossil fuels for space heating. The Commercial and Institutional sector includes small business and all levels of government. Land Use Change includes tree harvesting and clearing of land.

Figure 2.1.3 Yukon Greenhouse Gas Emissions (1990 to 2000)



While total Yukon emissions of greenhouse gases account for 0.07 per cent of total Canadian emissions, per capita Yukon people produce emissions at just below the Canadian average.

- Emissions associated with Yukon's oil and gas sector come from natural gas extraction at the Kotaneelee Gas Plant in the southeast.

Why is it happening?

- Because of Yukon's small population and low levels of industrial activity, total greenhouse gas emissions are low on a global, even national scale. However, because of the Yukon's northern location and large distances between communities and transportation hubs as well as lower economies of scale, Yukon's per capita emissions are relatively high.
- Fluctuations in Yukon's total emissions primarily reflect resource sector booms, specifically openings and closures of the Faro Mine and the associated energy needs.

Why is it significant?

- The impacts of climate change as a result of human-made greenhouse gas emissions are far-reaching (see also 2.3 Impacts of Climate Change).
- Climate change is a global, national, regional, local and individual issue. No individual or region is free from the potential negative impacts and every individual, region and nation are producing some portion of the total global emissions.
- Having accurate Yukon greenhouse gas emission data is critical to developing a low-emission, sustainable Yukon economy.

What is being done about it?

- The Government of Canada ratified the Kyoto Protocol and came out with a national climate change action plan in December 2002, which outlines a broad scope of actions to be taken by individuals, industry and governments to reduce Canada's overall greenhouse gas emissions.
- The Yukon is an award-winning leader in energy efficiency and climate change education. The Government of Yukon is finalizing a climate change action plan. A 2001 Yukon Inventory of Climate Change Initiatives is available at http://www.environmentyukon.gov.yk.ca/epa/content/initiatives.pdf.
- The Northern Climate ExChange (NCE) opened in February 2000 at the Northern Research Institute of Yukon College. It was created in response to growing concern over the impacts of climate change on the land, life, and communities of northern Canada. The centre carries out a broad range of activities to achieve its mission: to provide a credible independent source of information, develop shared understanding and promote action on climate change in northern Canada. (http://www.taiga.net/nce/index.html)
- The Energy Solutions Centre opened its doors in the fall of 2000. It is a service and program delivery agency for the federal government and Government of Yukon's programs relating to energy efficiency and green power. (http://www.nrgsc.yk.ca/)

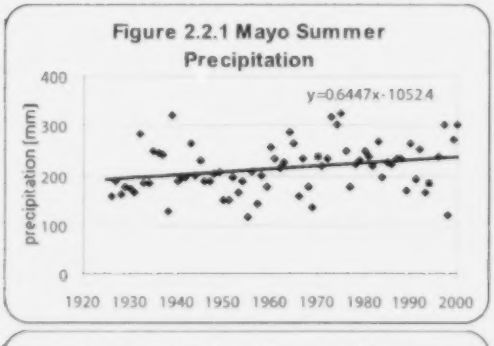
The Northern Climate ExChange (NCE) opened in February 2000, in response to growing concern over the impacts of climate change on the land, life, and communities of northern Canada.

2.2 PRIMARY INDICATORS OF CLIMATE CHANGE

What is happening?

- Global temperatures are changing. Globally, nine of the ten warmest years have occurred since 1990, with 2001 being the second warmest year since climate records have been kept. The global average surface temperature has increased by 0.6 °C since the beginning of the Twentieth Century.
- Yukon temperature and precipitation records have been kept—the period of record—since 1900 in Dawson City and the 1920s to the 1960s for a number of the communities. The frequency of data collection varies among communities.
- Figures 2.2.1 and 2.2.2 show the data points and increasing trend lines of Mayo summer precipitation and mean monthly temperature. Plots of other community data are available at the Yukon's Department of Environment State of the Environment website

Globally nine of the ten warmest years have occurred since 1990



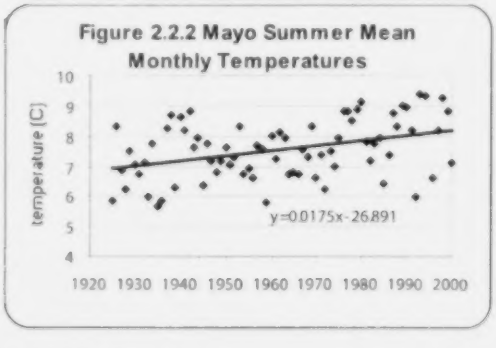


Table 2.2.1 Temperature and Precipitation Trends in Yukon Communities						
Community	Total Precipitation			Mean Monthly Temperatures		
	summer	winter	annual	summer	winter	annual
Glacial Hydrologic Zone						
Burwash Creek	decrease	decrease	decrease	increase		
Haines Junction	increase	increase	increase	increase	increase	increase
Interior Hydrologic Zone						
Watson Lake	increase	decrease	decrease	No change	No change	No change
Whitehorse	increase	decrease	increase	No change	increase	increase
Dawson City	increase	increase	increase	increase	increase	increase
Mayo	increase	decrease	increase	increase	increase	increase
Northern Hydrologic Zone						
Old Crow	increase	increase	increase	increase	increase	increase
Arctic Hydrologic Zone						
Shingle Point	increase	increase	increase	increase	increase	increase
Inuvik	decrease	decrease	decrease	increase	increase	increase

All of the communities measured, except for Watson Lake and Whitehorse in the summer, show increases in mean monthly summer, winter and annual temperatures over the period of record.

(www.environmentyukon.gov.yk.ca/soe/soe.shtml).

- Based on the data collected, Table 2.2.1 provides summaries of summer, winter and annual precipitation and temperature trends in a number of Yukon communities.
- All of the communities measured, except for Watson Lake and Whitehorse in the summer, show increases in mean monthly summer, winter and annual temperatures.
- Precipitation is more variable: seven of the nine communities show an increase in total summer precipitation; five of the nine communities show a decrease in winter precipitation; and six communities show an overall annual increase. (see Figure 3.2.1 Map of Yukon Hydrologic Zones)

Why is it happening?

- Over time, the Earth's climate has been variable as a result of changes in the Earth's orbit around the sun, the reflective and absorption qualities of the Earth's various atmospheric layers, and occurrences such as volcanic eruptions.
- Natural global and local climate variations occur as a result of numerous land and atmospheric interactions. However, increasing evidence is leading most climate scientists to believe that current climate warming trends are caused primarily by human production of greenhouse gases. Global temperature trends match the trends of carbon dioxide levels in the troposphere, which appear to be at unprecedented high levels.
- In addition to global changes, there are local and regional climate phenomena such as El Niño, La Niña and Pacific Decadal Oscillation (PDO) that influence a number of the environmental indicators in other sections of this report.

Why is it significant?

- Primary temperature and precipitation data collection and analysis provides a foundation for understanding and predicting climate changes and potential impacts, globally and regionally.
- Climate change scientists analyze long term weather data in different ways to try to predict future weather patterns. Measuring maximum and minimum temperature trends and their seasonal occurrence may tell a different story than mean monthly temperature trends. Changes in wind direction and speed over time may also help determine future weather patterns. Extreme weather events appear to be increasing in parts of the world but they are difficult to scientifically define as an indicator of climate change.
- Overall, climate change scientists predict that the north may experience earlier and greater climate changes.
- Changing climate patterns could negatively impact and alter economic, environmental, social and cultural structures in the Yukon.

What is being done about it?

- The Northern Climate ExChange carries out a wide range of on-going and targeted projects to promote and coordinate climate change research and education in, and about the north.
- Globally, including the Yukon, an increasing number of multidisciplinary studies, such as ice core dating to determine historical weather patterns, are being undertaken to advance climate change science and better understand and predict global and regional climate patterns.
- Environment Canada and the Yukon's Water Resources Branch are participating in a 3-year, $2.7 million international, multi-partner project to study the interaction of vegetation and snowpack distribution, and assess the influence of this interaction on hydrological and atmospheric exchanges.
- Environment Canada continues to operate weather stations in many of Yukon's communities.

Primary temperature and precipitation data collection and analysis provides a foundation for understanding and predicting climate changes.

- Environment Canada is continually improving the accuracy of climate models and contributes scientific climate data and analysis to the *United Nations Intergovernmental Panel on Climate Change*.

2.3 IMPACTS OF CLIMATE CHANGE

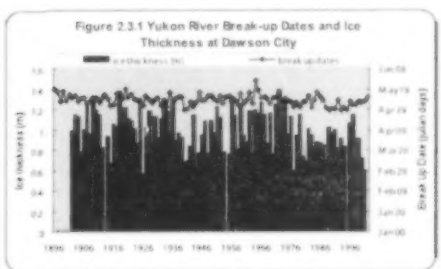
What is happening?

- The impacts of a changing climate are complex and difficult to forecast and equally challenging to measure. However, the impacts could be far-reaching and affect Yukon's environment, culture, society, and economy. A few Yukon-specific potential indicators of climate change impacts are outlined below:

Ice Thickness and River Break-up Dates

- Over the course of the last century the average spring break-up date of the Yukon River at Dawson City has advanced by 6 days. The trend can be seen in Figure 2.3.1. January 1 is 1 Julian Day. April 30 is 120 Julian Days.

Over the course of the last century the average spring break-up date of the Yukon River at Dawson City has advanced by 6 days.



- This trend towards earlier spring break-up dates has been more acute in the last decade, as five of the seven late April break-up dates over the last century, have occurred since the mid-1980s. By comparison there are no significant changes in the break-up dates of the Porcupine River at Old Crow.
- Ice thicknesses are variable but show a general decreasing trend since the mid-1970s.

Mean Annual Flood Trend Distribution

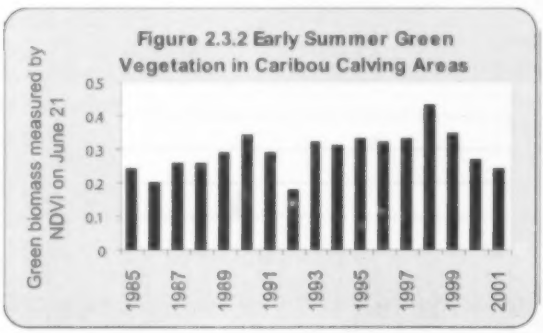
- The mean annual flood trend distribution is a measure of annual peak river flows over time. Peak river flows show a progressive decrease moving northward. Peak river flows from glacially-fed St. Elias and Coast Mountains in southwest Yukon have increased significantly. See also 3.2 Water Quality, Quantity and Use for an analysis of these trends.

Snowpatch Melt-out

- Over 70 mountain-top snow and high altitude ice patches, some as old as 8000 years, have been melting in southwest Yukon – an area between Carcross and Burwash Landing – since August 1997 when the first melting ice patch was discovered. As they melt they expose ancient biological specimens such as caribou dung and archaeological specimens such as ancient hunting tools. Since the end of 1999, the rate of melting slowed and no melting was observed during the summer of 2002.

Porcupine Caribou – Available Forage

- Figure 2.3.2 shows the relative amount of green plant material within the Porcupine caribou calving grounds on June 21 between 1985 and 2001. *Normalized Difference Vegetation Index (NDVI)* is a measure of the amount of green plant biomass present at a given time. There is no apparent trend over this period of record.



Spruce Bark Beetle Emergence (see also 6.2 Ecosystems: Forests)

- The forests affected by the *spruce bark beetle* in southwest Yukon increased from 22,600 hectares in 2001 to 69,415 hectares in 2002. The rate of infestation increase is more than 300 percent and the cumulative area of infestation now exceeds 250,000 hectares.

Why is it happening?

Ice Thickness and River Break-up Dates

- The break up of river ice depends on a number of factors including snow cover, wind speed and direction, solar radiation and channel and streamflow characteristics. It is also influenced by ice thickness as well as ice integrity—how jumbled the ice is. However, break-up dates can be fairly accurately estimated by the summation of spring air temperatures above freezing.
- The trend of warmer winters (see also 3.2 Primary Indicators of Climate Change) in both Dawson City and Old Crow has generally resulted in thinner ice cover, which has likely contributed to earlier break-up dates in Dawson City. However, warmer winters

can also lead to premature break-up events that subsequently re-freeze, creating thicker "jumble ice". This can delay the final break-up but increase potential for ice jamming.

Community View

- More unknown insects, some of which are described as large beetles and bees and some kind of ladybug, have been seen in Mayo, Carcross/Tagish, Burwash/Destruction Bay, Whitehorse/Laberge, and Pelly Crossing by most of those asked in those communities.
- One person in Ross River observed unknown moths (and spiders), another saw an unknown spider in Dawson.
- At Sulphur Creek, one person saw a black and green beetle for the first time. One person reported seeing a tiny red biting fly.
- Although most people asked in Teslin, Dawson and Watson Lake agreed that the days kids needed insect repellent on to play outside had remained the same, most of those asked in six other areas (Burwash/Destruction Bay, Whitehorse/Laberge, Haines Junction, Old Crow, Carmacks and Pelly Crossing) indicated that there were more such days.

Mean Annual Flood Trend Distribution

- The significant increase of peak river flows from glacially-fed rivers may be directly associated with warmer winter and summer temperature trends, that may be causing increased glacial melt.

Snowpatch Melt-out

- Alpine climate patterns are complex and locally variable. Ice patches may be melting because of general warmer summer and winter temperature trends in the region but this is by no means certain. Studies have shown that the same ice patches may have experienced a melting period in the 1950s.
- Ice patches may now be static or even advancing in some cases. Short term weather patterns such as El Niño or longer term patterns such as the Pacific Decadal Oscillation (PDO) may also be influencing melting patterns. More information is needed to better understand the causes of the melting.

Porcupine Caribou

- Early summer plant growth is temperature-dependent. For example, low biomass in 1992 is linked to the cool conditions associated with the eruption of the Pinatubo volcano. High biomass in 1998 may reflect the warmer 1997/98 winter associated with El Niño.

Spruce Bark Beetle

- Insects may be expanding their range to the north, in part, as a result of warming conditions and lower than average levels of winter precipitation in some areas. The infested areas are generally older forests and in zones that experienced recent drought conditions. Older trees are more prone to disease or insect infestation and drought further diminishes a tree's resistance to beetle damage.

Why is it significant?

Ice Thickness and River Break-up Dates

- Spring break-up represents the end to winter and the opening up of key transport and recreation routes as well as changes in patterns of wildlife movement. Spring break-up also brings the risk of flooding caused by ice jams, which is generally the most severe type of flooding. The majority of Yukon communities are situated on floodplains along river corridors. Old Crow and Dawson City are particularly susceptible to ice jam flooding while other communities have experienced flooding from rapid snow or glacier melt, or intense rain events. Changing climate, particularly warming winters and increasing precipitation could impact the frequency and/or severity of these events.
- Increased risk of flooding has a direct impact on buildings and infrastructure.

The significant increase of peak river flows from glacially-fed rivers may be directly associated with warming winter and summer temperature trends.

Snowpatch Melt-out

- The melting patches—their melt rate and location—provide an opportunity for multidisciplinary research and some clues to understanding climate changes. Pollen from exposed patches provides insight into changes in climate; ice cores measure oxygen isotope ratios, which reveal temperature shifts over time; assessment of ancient caribou bones provide information on contaminant levels such as heavy metals; and much information can be gained from the DNA from elk and sheep bones as well as plant material and seeds collected from dung.
- The ice patches have also become the focus for archaeological research for scientists and First Nations. The exposures have revealed the historical abundance of caribou. Hunting blinds and weapons indicate the location of historical hunting grounds and hunting methods.
- There is an urgency to collect much of this information if the ice patches resume melting at the same rate as in the late 1990s.

Alpine climate patterns are complex and locally variable. Ice patches may be melting because of general warming summer and winter temperature trends in the region but this is by no means certain.

Porcupine Caribou

- Climate change predictions of earlier snow melt and continuation of the current warming trend could lead to a trend of earlier green-up in caribou calving areas. Scientists have determined a positive relationship between the timing of green-up and early survival of calves.

Spruce Bark Beetle

- The significant increase in spruce bark beetle activity follows a recent drought period in the area that has appeared to have subsided. The effects of insect populations that build up during a drought often take years to be noticed. Therefore it is not known at this point whether insect activity will subside over the next few years or whether the duration and intensity of insect and disease activity may continue to increase beyond historic levels, as a result of longer term climate conditions. The infestation could affect the short-term *ecosystem resilience* of some Yukon forests.

What is being done about it?

Ice Thickness and River Break-up Dates

- The Water Resources Branch of Yukon's Department of Environment monitors ice conditions upstream and downstream of Dawson City and Old Crow to estimate timing of break up and predict flooding potential.

Snowpatch Melt-out

- The snowpatches are the site of a number of archaeological, biological and climate change-specific research studies as well as youth science camps. New methods are being explored to assess the artefacts without relying on summer melting conditions.

Porcupine Caribou

- A range of caribou studies and monitoring programs are on-going, particularly as part of the Arctic Borderlands Ecological Knowledge Co-operative

Spruce Bark Beetle

- A number of projects such as the Canadian Forest Service's Forest Health Assessment project are being carried out to better understand the impact of recent beetle infestations on forest ecology.

3.1 DRINKING WATER QUALITY

What is happening?

- The safety of drinking water continues to be a significant public concern in the Yukon and Canada-wide.
- The Yukon continues to use, as it has for many years, the most current edition of the *Guidelines for Canadian Drinking Water Quality* (GCDWQ) as its standard for interpreting drinking water test results. A summary of the GCDWQ is available on Health Canada's website www.hc-sc.gc.ca.
- Standards for safe, quality drinking water are different from standards for water quality required to maintain aquatic ecosystem health in fresh water environments. (see also 3.2 Water Quality, Quantity and Use)
- Reports provided annually by public water system owners indicate that community drinking water quality is within the Yukon health-related parameters of the GCDWQ. An exception is the City of Whitehorse, which exceeds the guideline of 1 *NTU* for turbidity. While not a health risk, some supplies also exceed aesthetic limits for parameters such as iron and manganese.
- The Yukon Communicable Disease Control (YCDC) reports that there have been no diseases or illnesses or any documented waterborne outbreaks attributable to public water sources or systems during the 1999-2002 SOE reporting period.
- Although not every person who is infected or ill due to a waterborne disease seeks medical attention, communicable disease records are considered to be the main indicator of waterborne outbreaks in a community.
- On two occasions in 2002, treated water samples (one from a well water source and one from a water truck) tested positive for *coliforms;* in both cases, a precautionary "boil water advisory" was issued while measures were taken to ensure the water was safe. No cases of illness were reported during these events.
- The reliance on surface water to meet the City of Whitehorse's drinking water needs, in the absence of a filtration system, means that from time to time, water samples will test positive for *Giardia* and, possibly, *Cryptosporidium*. It also means that turbidity levels will be exceeded at times, particularly during spring run-off.

Why is it happening?

- Poor drinking water quality may be human- or animal-caused (e.g. contamination from faecal matter) or the result of natural conditions. Contamination may come from microbiological, chemical or physical sources. Contamination can occur at the water source or during distribution.
- In order to keep drinking water clean, safe and reliable, the components of the water supply system – from source protection to the treatment and distribution of drinking water to consumers – must be understood and managed as a whole, using a multi-barrier approach that focuses on all three elements (source protection, treatment, and distribution) in an integrated manner.

Table 3.1.1 Community Water Supply, Distribution and Treatment Facilities

Community	Water Source	Distribution	Treatment
Incorporated Communities			
Carmacks	private wells	n/a or trucked	none
Dawson City	community wells	piped	chlorination
Faro	community wells	piped	chlorination
Haines Junction	community & private wells	n/a or piped	chlorination
Mayo	community well	piped	chlorination
Teslin	community wells	trucked	none
Watson Lake	community wells	piped	chlorination
Whitehorse	surface/groundwater mix	piped	chlorination
Unincorporated Communities			
8 communities	community well (one has private wells too)	trucked or self serve & one piped	chlorination, one with filtration
8 communities	private well or intake	n/a	unknown or none
1 community (Carcross)	surface water intake (Bennett Lake)	trucked	filtration and chlorination
2 communities	private well or water delivery	n/a or trucked	unknown or none
First Nation Communities			
3 communities	private and/or shared wells	n/a (local distribution	unknown
2 communities	community and private wells	trucked	chlorination
2 communities	well for First Nation trucked water service	trucked	chlorination
1 community (Canyon Creek)	surface seepage to underground storage	trucked	none

Reports provided annually by public water system owners indicate that community drinking water quality is generally within the accepted Yukon health-related standards.

Community View:

- Of those asked, in six communities, most indicated they buy more bottled water. Some said they buy it to take with them when they go out onto the land.
- The majority asked in two communities noted that they do not buy bottled water at all.
- Most people asked in three communities agreed they boil water more in camp to prevent sickness.
- No one reported wells running dry as a problem.

Why is it significant?

- Recent outbreaks of waterborne disease in Walkerton, Ontario, and North Battleford, Saskatchewan have heightened Canadians' awareness of the fact that threats to water quality and quantity can have a profound impact on their health, the environment, and the economy. Drinking water quality is a critical human health issue.
- Assessment of drinking water quality includes tests that measure risks to human health as well as aesthetic qualities such as taste and appearance of water.
- Outside of Whitehorse, most of Yukon's drinking water comes from groundwater but very little is known about the resource in general.

What is being done about it?

Drinking Water Management and Monitoring

- Environmental Health Services, Department of Health and Social Services, Government of Yukon monitors Yukon's drinking water quality under the Yukon *Public Health and Safety Act* and its regulations.
- The Yukon Communicable Disease Control, Department of Health and Social Services, Government of Yukon monitors and reports on infectious and communicable diseases throughout the territory, including waterborne diseases.
- Public water system owners (including communities, Yukon and First Nation governments) must have a bacteriological monitoring program in place. The City of Whitehorse submits weekly water samples for analysis while smaller communities (populations of up to 2000) submit water samples monthly or bi-monthly.
- Environmental Health Services operates a water laboratory for the bacteriological analysis of drinking water.
- The Government of Yukon is considering options for enhancing the regulation of drinking water systems, including one or more of the following: source protection, distribution systems, inspections, water quality, sampling, record keeping, operator training and certification, permitting, enforcement, and water works management.
- As of the writing of the 2002 State of the Environment report, Health and Social Services, Government of Yukon is consulting on guidelines for regulating public drinking water systems and the bulk delivery of drinking water.
- The City of Whitehorse has taken action to ensure that water entering the distribution system does not exceed 5 NTU. Further reductions in turbidity would require the city to install a water treatment plant with appropriate filtration technology.

Building Knowledge

- A groundwater inventory for the Yukon has been initiated to assess physical, chemical and water quality characteristics of Yukon's aquifers. (see also 3.2 Water Quality, Quantity and Use)
- The City of Whitehorse is developing a watershed protection management plan.

Training and Public Education

- With the formation of the Yukon Chapter of British Columbia Water and Waste Association (BCWWA) in 2001, training courses and certification exam opportunities are now readily available in the Yukon. Most operators of community water systems have attended training courses put on by the BCWWA and many have obtained certification.
- Recognising that there are limitations in the reporting of illnesses, YCDC promotes education for the general public and health care providers to encourage people to be tested when suffering from gastrointestinal symptoms, such as diarrhea. Identification of the disease-causing organism assists in determining the source of the illness and enables YCDC to take steps to curb the spread of the infection.

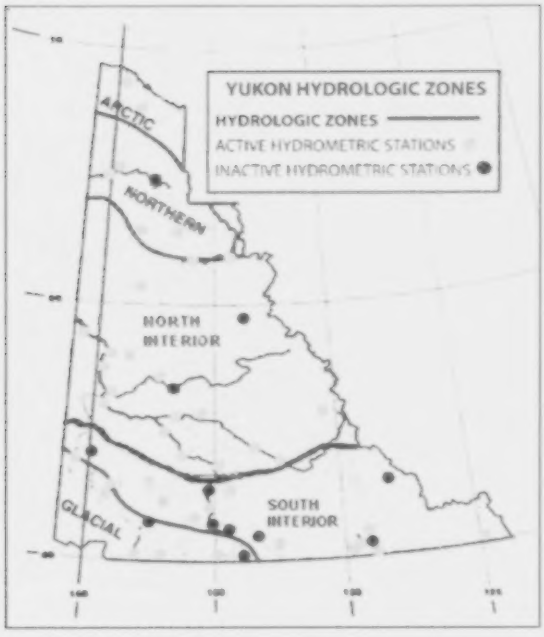


Figure 3.2.3 Annual Flow Variation Comparison

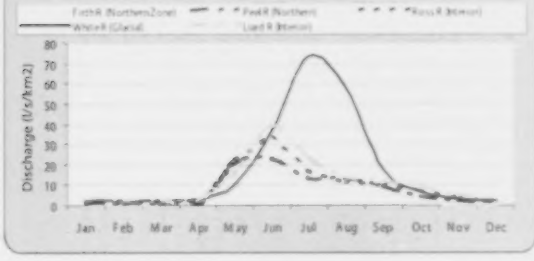
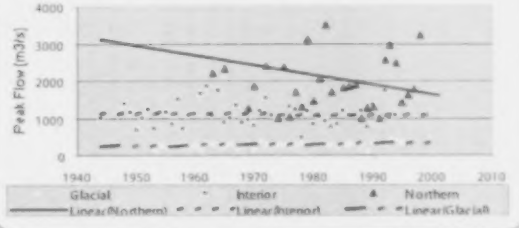


Figure 3.2.2 Mean Annual Flood Trendlines



3.2 WATER QUALITY, QUANTITY AND USE

WHAT IS HAPPENING?

Seasonal flow and Peak Flow Trends in Yukon's Hyrdrologic Zones (Flow)

- The Yukon is divided into four *hydrologic zones* as shown in Figure 3.2.1.
- Streamflow regimes, specifically peak flow trends are changing in a number of Yukon rivers, as shown in Figure 3.2.2. Annual peak flow or "mean annual flood" trends have not changed much in the Interior hydrologic zone. There is a progressive decrease of peak flow trends moving toward the Northern and Arctic zones. But peak flows of rivers with headwaters in the glacially-fed St. Elias and Coast Mountains (Glacial zone) have increased.
- Seasonal flow variation, as shown in Figure 3.2.3, is greatest in glacially-fed rivers like the White River and smallest in the flatter and colder Northern and Arctic hydrologic zones. Flows from glacially-fed rivers tend to peak later in the summer and taper off drastically as glacier melt diminishes. Flows in northern rivers peak late spring and taper off slowly, directly influenced by precipitation levels. Flow rates are lowest in late winter for most rivers.

Drinking water quality is a critical human health issue.

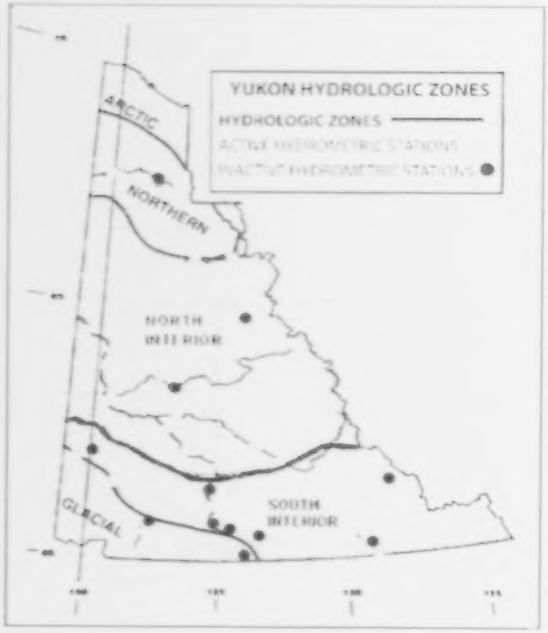
Water Use and Allocation

- Figure 3.2.4 is based on water licence use allowances and provides some idea of how water is used in the Yukon. However, it doesn't tell the whole story.
- It doesn't show actual volume of water used or all of the water users. For example, a number of the smaller Yukon community wells may not require a water licence so wouldn't be included.
- Placer mining shows the largest water allocation but the actual use in this sector has likely decreased along with the number of active placer mines since the last SOE reporting period.
- A water licence is based on annual use. Adjustments have been made to reflect seasonal uses such as placer mining and agriculture. "Other" uses include aquaculture.

Outside of Whitehorse, most of Yukon's drinking water comes from groundwater but very little is known about the resource in general.

Groundwater and Water Quality (Quality)

- In general, Yukon baseline monitoring studies have shown water quality to be good. Water quality can be affected by instream users, withdrawals, effluent discharges, runoff from adjacent land uses and physical changes to stream sections, including the removal of bank vegetation (e.g. inadequate tree buffer



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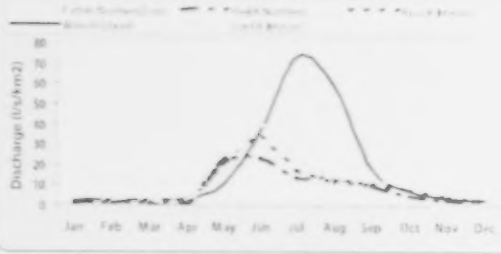

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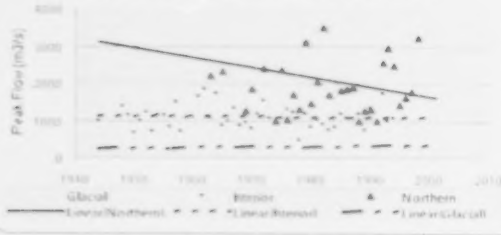

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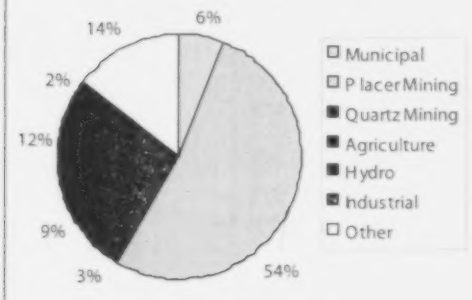
Figure 3.2.4 Annual Allocated Water Use by Sector



Community View

- Most people in ten communities saw an increase in the use of four stroke outboard motors on boats (more environmentally friendly). Some of those noted that cost is a factor in preventing people from changing over from two stroke outboard motors.
- Human land use on shorelines is reported to have increased in Carcross/Tagish, Whitehorse/Laberge, Haines Junction, Watson Lake and Carmacks, by most people asked.
- The majority in Pelly Crossing reported a decrease and in three other communities (Teslin, Mayo and Burwash/Destruction Bay) most asked said there was no change.

In general, Yukon baseline monitoring studies have shown water quality to be good.

left after logging or other site clearing).

- In general, Yukon baseline monitoring studies have shown surface water quality to be good.
- Many Yukon people rely on groundwater for domestic purposes, yet very little is known about the resource. (see also 3.1 Drinking Water Quality)

Sewage Treatment (Sewage)

- Overall, sewage treatment facilities in Yukon communities are in good condition with a few exceptions: Dawson City, Carcross and Burwash Landing are currently being upgraded.
- Many of Yukon's smaller communities use individual septic or holding systems. Holding systems are pumped out and trucked to central lagoons or infiltration pits. The larger piped collection systems are most often treated in multi-cell lagoons where the treated effluent is occasionally discharged into nearby rivers.

Overall, sewage treatment facilities in Yukon communities are in good condition with a few exceptions.

Why is it happening?

- (*Flow*) Stream flow and seasonal flow variations are dependent on physical characteristics such as topography, sediment load and vegetation and, more importantly, climatic elements such as precipitation and snow or glacier melt.
- Temperature and precipitation levels have been changing in the Yukon and as a direct result so have mean annual flood regimes. (see 2.2 Primary Indicators of Climate Change and 2.3 Climate Change Impacts).
- (*Quality*) Yukon's good quality water is attributable, in large part to the small population and lack of heavy industry in the territory.
- Groundwater comes with natural filtration and protection from surface contamination, so often provides a good source for drinking water.
- (*Sewage*) The screened-only continuous effluent discharge into the Yukon River at Dawson City was deemed unacceptable by the Yukon Water Board, so constructing a new facility has been initiated.

Why is it significant?

- (*Flow*) Hydrometric (streamflow) monitoring is carried out to estimate water availability for human use, forecast flooding, predict levels of contaminants downstream from industrial effluent discharges, and monitor long term environmental change. Changes in mean annual flood trends affect these types of analyses.
- Increasing peak flows increase the magnitude of *design floods* used for engineering design of bridges, dams, water supply and effluent treatment facilities etc. Existing structures that were designed using lesser design flood specifications may not be structurally adequate for greater flows. This may be of particular concern for abandoned mine sites.
- Changing streamflow regimes can impact aquatic life and habitat, and shoreline ecology.
- (*Quality*) The water quality of runoff from mine sites that are abandoned, or undergoing decommissioning, is being monitored. This includes the large metal mines at Faro, Mt. Nansen and Elsa. At some sites ongoing water treatment is being carried out.
- Groundwater is often warmer than surface water so it doesn't have to be heated for winter distribution when used as a source for domestic water.

Table 3.2.1 Summary of Community Treatment Facilities				
Community	Sewage Treatment Type			
	Primary	Secondary	Tertiary	Upgrade Plans
Beaver Creek	X			
Burwash Landing	X			Proposed new treatment facility
Carcross		X		New treatment facility
Carmacks	X			New treatment facility
Dawson City	Screening only			New treatment facility
Destruction Bay		X		See Burwash Landing
Faro		Advanced		
Haines Junction		Advanced		
Keno City	X			
Marsh Lake		X		
Mayo		Advanced		Collection system upgrade
Old Crow		X		
Pelly Crossing	X			
Ross River	X			
Tagish	X			
Teslin		X		
Upper Liard	X			
Watson Lake		Advanced		
Whitehorse			X	Collection system upgrade

Groundwater can be a heat source as well as a source for quality drinking water.

In fact groundwater can provide space and water heating through the use of a ground source heat pump.

- (*Sewage*) Untreated sewage can contain components that are toxic to fish and micro-organisms that can cause human illness.

What is being done about it?

- The Wolf Creek Research Basin project is a multidisciplinary, international research site originally designed, in 1993, to improve knowledge about Yukon waters. Currently more than 30 individual research and monitoring projects are underway or completed, contributing information to areas such as hydrologic modelling, climate change impact assessment and flood forecasting. It hosts the first groundwater observation well in the Yukon, established in March, 2001.
- A study, jointly funded by DIAND, the Government of Yukon and the City of Whitehorse, resulted in the development of a groundwater database, which will be maintained by the Yukon's Water Resources Branch, Department of Environment. In addition, a preliminary groundwater inventory of the Whitehorse area is being completed. This work is being carried out by the Energy Solutions Centre and will include assessment of ground source heat potential for Yukon communities.
- A pilot study, about aquifer usage, quality and characteristics in the Wolf Creek and Pine Ridge areas of Whitehorse, was completed during this SOE reporting period.
- The Canadian Environmental Quality Guidelines are used to assess the quality of fresh water to maintain healthy aquatic ecosystems. In some cases, BC's water quality criteria are used if they more closely reflect conditions and aquatic species found in the north.
- A Sequencing Batch Reactor (SBR) mechanical treatment facility has been designed for Dawson City and construction scheduling is underway.
- The existing mechanical treatment plant in Carmacks will be replaced by a new facility for which preliminary design and a water licence.
- A ground-based lagoon system has been designed for Burwash Landing and construction scheduling is underway.

Chapter 4 Land

4.1 PROTECTED AREAS

Management planning of five special management areas was initiated during this reporting period.

What is happening?

- Management planning of five special management areas was initiated during this reporting period (2000-2002). These areas include: Tombstone and, Fishing Branch Territorial Parks; Ddhaw Ghro and Lhutsaw Habitat Protection Areas; and Ta'tla Mun Special Management Area.

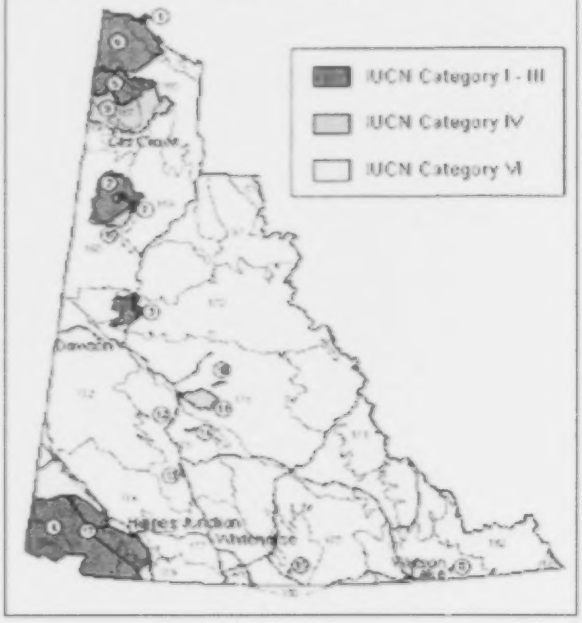
Why is it happening?

- Protected areas in the Yukon are being established through Special Management Areas (SMAs) as provided for in First Nation Final Agreements (FNFAs).
- Ta'an Kwäch'än First Nation is the only First Nation that finalized and ratified its Final and Self Government Agreements since 1999. No SMAs were included in its Final Agreement.
- On March 31, 2002 Carcross/Tagish, Kluane, Kwanlin Dun and White River First Nations each signed a Memorandum of Understanding with Yukon and federal governments signifying that substantive negotiations had been concluded and that the parties were committed to the next steps. As FNFAs are completed and ratified, the included SMAs will be implemented.

Why is it significant?

- Globally and locally, protected areas provide a cornerstone for protecting biodiversity and ecological and cultural heritage. They are also important for research and education, and contribute significantly to local communities and regional economies, most obviously through tourism.
- In 1992, Canada and 167 other countries signed the Convention on Biological Diversity. The establishment of networks of protected areas, to conserve biodiversity, was part of this agreement.
- Later in 1992, federal, provincial and territorial ministers responsible for parks, wildlife, forestry and the environment signed a commitment to complete Canada's network of protected areas, Yukon was included in that commitment.
- In the Yukon, protected areas are important to First Nations, particularly when established as SMAs through their FNFAs. Protected areas are also critical to tourism (see also 4.7 Land Use - Tourism) and provide recreation destinations for Yukon people.

Figure 4.1.1 Map of Yukon Protected Areas



No.	Protected area	Size (approx.) km²
Category I and II: Strict Nature Reserve Wilderness Areas, National Parks(43674 km²) Management Purpose (MP): (I) science and wilderness protection and (II) ecosystem protection and recreation		
1	Herschel Island Territorial Park	113
2	Fishing Branch Wilderness Preserve	5217
3	Tombstone Territorial Park (not yet designated)	2113
4	Kluane National Park	22159
5	Vuntut National Park	4378
6	Ivvavik National Park	9099
Category III: Natural Monument (185.7 km2) MP: conservation of specific natural features		
7	Fishing Branch Ecological Reserve	169.7
8	Coal River Springs Ecological Reserve	16
IUCN Category IV: Habitat/Species Management Areas (10647 km2) MP: conservation through management intervention		
9	Old Crow Flats Special Management Area (excludes Settlement land)	7785
10	Horseshoe Slough Habitat Protection Area	27
11	Ddhaw Ghro Habitat Protection Area	1910
12	Lhutsaw Wetlands Habitat Protection Area	32
13	Nordenskiold Wetlands Habitat Protection Area	77
14	Ta'Tla Mun Special Management Area	33
15	Nisutlin River Delta National Wildlife Area (check name)	55
16	Fishing Branch Habitat Protection Area	575
IUCN Category VI Managed Resource Protected Area (6405 km2) MP: sustainable use of natural ecosystems		
17	Kluane Wildlife Sanctuary	6405

The ecoregion names corresponding to code numbers on the map are provided in the Glossary.
Differences in numbers from 1999 SOE chart are due to mapping technology changes.

Community View

- Of those asked, most people in Teslin, Mayo, Carcross/Tagish and Faro/Ross River are finding there are more green spaces available for recreational or traditional use, while most in Whitehorse/Laberge, Watson Lake and Carmacks have noticed no change.
- A majority of people asked in twelve out of thirteen communities reported an increase in the use of motorized vehicles off road. Many people commented that it has been a dramatic increase.

What is being done about it?

- The Yukon *Parks and Land Certainty Act* was passed in late 2001 and gives the Government of Yukon the legal authority to manage park lands. Habitat protection areas can be established under the *Wildlife Act* and SMAs are established under FNFAs.
- The International World Conservation Union (IUCN) is an international organization established to encourage societies throughout the world to conserve the integrity and diversity of nature, in part, through the creation of protected areas. It has developed standardized categories, as shown in the Figure 4.1.1 chart, to enable protected area accounting around the globe. (http://www.iucn.org/themes/wcpa/wcpa/protectedareas.htm)

New First Nation Final Agreements may provide for further protected areas through negotiated Special Management Areas.

4.2 WASTE: SOLID, SPECIAL, RECYCLABLES AND COMPOST

What is happening?

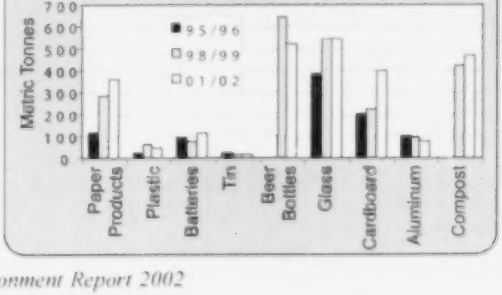
- The waste we produce can be classified as solid, special, recyclable or compostable.
- There are 26 solid waste disposal sites in communities throughout the Yukon. Data on the type of waste deposited is only available for the Whitehorse landfill.
- "No-burn" pilot projects were carried out at three solid waste disposal sites between 2000 and 2002. Research is being completed by the Department of Community Services, Government of Yukon to determine the costs and benefits of a system of community transfer stations, using central landfill site(s) in the Yukon.
- Scales were installed at the Whitehorse landfill in late 1999 to track waste amounts and allow for tipping fee charges.
- In 2000, 16.8 percent of City of Whitehorse waste was diverted from the landfill through recycling, composting and other programs.
- As a result of the first eight months (May to December 2002) of the City of Whitehorse's city-wide curbside compost collection program, an additional 34 percent of total residential waste has been diverted from the landfill.

Why is it happening and why is it significant?

- There are significant direct and indirect risks and costs associated with waste disposal including fire, public health and safety, waste disposal site development and operations, and air and water pollution.
- Recycling can generate income and employment. For example the mineral value from aluminium, scrap metal and lead batteries received by Raven Recycling Society in 2001 was approximately $130,000. Raven Recycling Society has 14 full time-equivalent employees. Figure 4.2.1 shows the waste product types and amounts the Society is recycling.
- In 1994, the City of Whitehorse determined that 69 per cent of residential landfill waste could be composted or recycled.
- Landfill use can be extended by changing and/or diverting the waste stream and improving landfill techniques.
- Diverting compost helps to extend the life of the landfill and protects groundwater by decreasing the likelihood of producing acidic leachate that can draw out heavy metals. It also reduces greenhouse gas emissions by reducing methane and it produces a useful product.

As a result of the first eight months of the City of Whitehorse's city-wide curbside collection program, 34 percent of total residential waste has been diverted from the landfill.

Figure 4.2.1 Waste Diverted by Raven Recycling



Landfill use can be extended by changing and/or diverting the waste stream and improving landfill techniques.

Table 4.2.1 Community Waste Treatment and Recycling Facilities	
Waste Treatment/Recycling	**Yukon Communities**
No Burning of Domestic Waste	Whitehorse, Mount Lorne, Dawson City and Haines Junction (burning of brush and construction debris only)
Weekly or As-required Burning	Beaver Creek, Braeburn, Burwash Landing, Canyon Creek, Carcross, Carmacks, Champagne, Deep Creek, Faro, Johnson's Crossing, Keno City, Marsh Lake, Mayo, Old Crow Domestic, Pelly Crossing, Ross River, Silver City, Stewart Crossing, Tagish, Teslin, Upper Liard, Watson Lake
Recycling In Town or at Solid Waste Facilities	Beaver Creek, Burwash Landing, Carcross, Carmacks, Dawson City, Faro, Haines Junction, Mayo, Mount Lorne, Old Crow, Pelly Crossing, Ross River, Tagish, Teslin, Watson Lake, Whitehorse
No Recycling Facilities	Braeburn, Canyon Creek, Champagne, Deep Creek, Destruction Bay, Johnson's Crossing, Keno City, Marsh Lake, Silver City, Stewart Crossing, Upper Liard

What is being done about it?

- In May 2002, the City of Whitehorse initiated a city-wide curbside compost collection program.
- Since 1994, through the special (hazardous) waste collection program, the Government of Yukon has collected and treated 290 tonnes of special waste. In 2002 alone, more than 47 tonnes of special waste were collected. In 2003, the City of Whitehorse will partner with Government of Yukon to hold five household hazardous waste collection days.

Recycling can generate income and employment.

- Through the Waste Reduction and Recycling Initiative, the Government of Yukon has been investing in recycling and composting infrastructure and removing troublesome wastes (tires, waste oil, appliances) from Yukon landfill sites.
- Since 1995, more than two million litres of waste oil have been transported within the territory for use as an alternative fuel or outside the territory for treatment and re-use. There are currently 34 waste oil burners operating in the territory.

In 2002 alone, more than 47 tonnes of special waste were collected.

- In order to establish a higher, more uniform standard of operation, solid waste management plans are required, under the Yukon *Environment Act*, for all solid waste facilities in the Yukon.
- The number of community recycling centres has increased from 22 in 1995 to 32 in 2002.
- The Beverage Container Program provides refunds for all beverages (except milk) in glass, plastic, tin, aluminum and tetrapak containers. In 1994/95 the program only provided refunds for aluminum cans and liquor containers. Yukon people returned approximately 25 percent more containers in 2000/01 than in 1994.
- In June of 2001, the Yukon Brewing Company brought a bottle washing system on line, which has reduced the shipment of empty beer bottles out of the Yukon, to Vancouver by approximately 14 percent.

Community View:

- When asked about the number of trips to the recycling center they made, most people in eight communities reported an increase.
- No increase in the storage of special waste, such as paint, solvents, cleaners, waste oil and other petroleum products, at homes was reported, but most people that were asked in Whitehorse/Laberge, Old Crow and Watson Lake have seen a decrease. Some said it was due to the availability of disposal sites.
- Use of free stores at landfill sites has increased in Mayo, Carcross/Tagish, Burwash, Whitehorse, Old Crow and Carmacks according to most people asked. The majority in three other communities reported no change.
- Litter on the roadside within 20 km of the community was less in Burwash/Destruction Bay, the same in Teslin and Carcross/Tagish and more in Whitehorse/Laberge and Watson Lake, by most people asked.
- Most people asked in Pelly Crossing said they found less garbage dumped in the bush, while the majority of people asked in five other areas found more garbage in the bush. In five more communities most found there had been no change.

What is it?

- A contaminated site is defined as:
  - "a site at which substances occur at concentrations: above background levels and pose, or are likely to pose, an immediate or long-term hazard to human health and the environment; or exceed levels specified in policies and regulations;"[1] or
  - "an area of land in which the soil, including any groundwater lying beneath it , or the water including the sediment and bed below it, contains a contaminant which is an amount, concentration or level in excess of that prescribed by regulation or allowed under a permit."[2]
- The source of contamination for the majority of Yukon sites is fuel (petroleum-hydrocarbon) contamination. The cause can be leaky tanks or spills during fuel transfer (e.g. fill lines) or transport. Other contaminant sources include heavy metals from ore handling, lead paint, asbestos, or even concentrations of road salt.
- Contaminated sites can be large areas with multiple contaminant sources, such as some mine sites, or small areas with one contaminant source, such as a one-time fuel leak.
- Not all contaminated sites pose a threat to human or environmental health. The sites that do, however, must be properly managed to ensure human and environmental protection.
- The Yukon and federal governments both have regulatory responsibilities for contaminated sites through the Department of Environment and Environment Canada respectively.
- The Government of Yukon's Contaminated Sites Regulation (CSR), under the Yukon *Environment Act*, applies to all non-federally-controlled land. This includes Commissioner's, municipal and private land as well as First Nation land, where there is no First Nation legislation equivalent to the CSR.
- The CSR's purpose is to protect human health and the environment from harmful contaminants in soil and water. The CSR outlines what is required for the investigation, assessment and remediation of a contaminated site. Additional powers under the Yukon *Environment Act* allow for action to be taken for those sites considered to pose a threat to human health or the environment.
- Indian and Northern Affairs Canada (DIAND) Contaminated Sites Management Policy provides guidance for the management of contaminated sites and applies to all federally-controlled land north of the 60th Parallel.

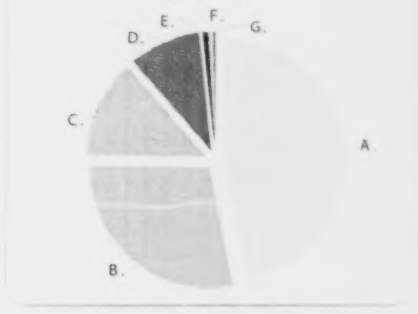
The source of contamination for the majority of Yukon sites is fuel (petroleum-hydrocarbon) contamination.

4.3 CONTAMINATED SITES

What is happening?

- Under the Indian and Northern Affairs Canada (DIAND) Waste Management Program (WMP), 907 abandoned, potentially contaminated sites have been identified to date in the Yukon. As shown in Figure 4.3.1, the sites have been divided into seven categories according to the type of remediation or further assessment required, and the responsible party.
- On April 1, 2003, administration and control of water, land and natural resources will be transferred from Canada to the Government of Yukon in accordance with the Devolution Transfer Agreement (DTA). As part of this transfer, the management of most land in the territory will be transferred to the Government of Yukon, including waste and contaminated sites on federal land.
- Under the DTA, the federal government has allocated funding for the assessment and remediation of contaminated sites according to the above categories. The DTA also provides for a process to identify and assign responsibility to newly discovered contaminated sites.

Figure 4.3.1 Federal Waste Management Site Classification April 1, 2003



Legend

A. Remediated (426)
B. Remediation not required (257)
C. Assessment required (121)
D. Remediation required (87)
E. "Type I" site (6)
F. "Type II" sites (7)
G. Contained sites (25-150 year warranty) (3)

- For categories C and D (assessment and/or remediation required), Canada has allocated $ 2 million per year for 10 years for site assessment and remediation. This work will remain the responsibility of DIAND under the WMP after devolution.

Under the Indian and Northern Affairs Canada (DIAND) Waste Management Program (WMP), 907 abandoned, potentially contaminated sites have been identified to date.

- Category F (Type II) refers to mine sites that could result in unfunded environmental liabilities for government. Under the DTA, Canada has allocated additional funding in this category to pay for interim care and maintenance/site management, abandonment planning, and reclamation. (see also 4.4 Land Use-Mining)
- On Commissioner's Land, Transport Canada, as part of the airport transfer agreement is assessing and remediating a number of small hydrocarbon-contaminated sites at the Whitehorse and Watson Lake Airports. At the Whitehorse Grader Station, where contamination may be from multiple sources, an assessment is being completed and the responsible party will then be determined.
- The Marwell Tar Pit is a contaminated site, created during the dismantling of the Canol Refinery. It is on Commissioner's Land, as a result of land transfer, and the Government of Yukon is working to determine all the responsible parties so that further remediation steps can be taken.
- Seven mine (type II sites) sites that could result in unfunded environmental liabilities for government were identified in the Yukon, under the Indian and Northern Affairs Canada (DIAND) Waste Management Program (WMP).

Most complex contaminated sites in the Yukon and in other parts of Canada are older sites, where contamination occurred without today's better practices and legislation.

Why is it happening?

- Devolution of management of water, land and natural resources is part of an ongoing initiative to transfer administration and control of responsibilities from Canada to the Yukon.
- The Government of Yukon has on-going regulatory and educational responsibilities for contaminated sites under the Yukon *Environment Act*, particularly the Contaminated Sites Regulation. The federal government will have on-going responsibilities for contaminated sites as outlined in the DTA as well as a few parcels such as Reserve land and national parks in the territory.

The number of active quartz claims has declined 35 percent since 1998.

Why is it significant?

- Most complex contaminated sites in the Yukon and in other parts of Canada are older sites, where contamination occurred without today's better practices and legislation.
- The reduction and management of contaminated sites has a direct impact on human and environmental health.
- The party responsible for causing a site to be contaminated is responsible for any required assessment and remediation. However, in some cases the responsible party (or parties) is difficult to determine. Where there is no site operator, Canada is financially responsible for contaminated sites that occurred prior to April 1, 2003 , the date of the Devolution Transfer Agreement, and the Government of Yukon will administer those that occurred after April 1, 2003.
- The requirements in the DTA are intended to first and foremost, ensure protection of the environment and human health. It also provides an administrative structure to remediate and close sites in an orderly manner and reduce risk and liability to the Government of Yukon.

What is being done about it?

- The Contaminated Sites Regulation has been in place since 1997. Amendments were made in 2002 to allow for the use of risk-based standards, in keeping with most other jurisdictions, as well as requiring permits for land treatment facilities to encourage proper siting and operations.
- Under the CSR, the Department of Environment, Government of Yukon maintains a public registry of designated contaminated sites.
- The Government of Yukon is working with DIAND to establish procedures and working arrangements under the DTA to ensure that the Government of Yukon's interests are being fulfilled.
- The Yukon Housing Corporation has included the removal of residential underground oil storage tanks in their low-interest Home Repair Program. Although these tanks don't easily degrade in Yukon's dry climate and well-drained soils, this program is an example of pro-active prevention of contaminated sites.

4.4 LAND USE - MINING

What is happening?

- The number of active placer mines has been declining since 1995 as shown in Figure 4.4.1. There has been a 28 percent decrease since 1998.

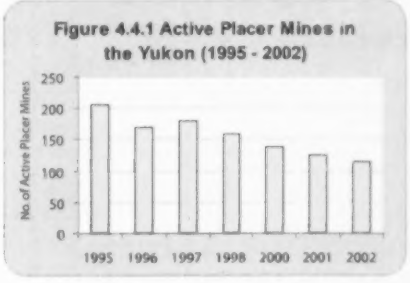


Table 4.4.1 Percent of Yukon Land Base Covered by Mining Claims		
Type of Claim	% of Yukon Land Base	
	1998	2002
Quartz Mineral Claims & Leases	2.90	1.51
Placer Claims	0.33	0.28

- There were 43,176 quartz mining claims in 2002. This represents a drop of 35 percent since 1998.
- As shown in Table 4.4.1, the percentage of the Yukon land base that contains quartz mineral claims and leases has declined.
- During this SOE reporting period an emerald exploration program in the Yukon began and was expanded in 2002.
- In December 2002, the Minister of Fisheries and Oceans made what proved to be a controversial announcement that the Yukon Placer Authorization (YPA), a class authorization under the Fisheries Act that has regulated placer gold mining in the Yukon since 1993, would be phased out over a period of four years.

Why is it happening?

- Placer mining operations are very sensitive to the price of gold as well as the cost of diesel. Gold prices began to decline in 1996 and diesel prices have fluctuated but increased over this period, particularly in 2001 and 2002.
- Placer gold availability is decreasing as reserves in traditional placer mining areas are becoming more difficult to find.[1]
- The basis for the decision about phasing out the Yukon Placer Authorization (YPA) was "to better protect fish and fish habitat and to be more consistent with its treatment of other industries across Canada."[2] The Klondike Placer Miners' Association argued that this decision went against the consensus recommendations of the Minister's own YPA committee and it could put more than 50 percent of Yukon's placer miners out of business.[3]

Why is it significant?

- Placer mining has a long history in the Yukon. It is the Yukon's second largest industry next to tourism and is itself a major tourist attraction. Mining exploration and development has historically left the largest environmental footprint compared to other Yukon industries.
- Better industry practices, technology and an effective, balanced regulatory regime are critical to ensuring a viable industry as well as adequate environmental safeguards to avoid environmental liabilities. (See also 4.3 Contaminated Sites).

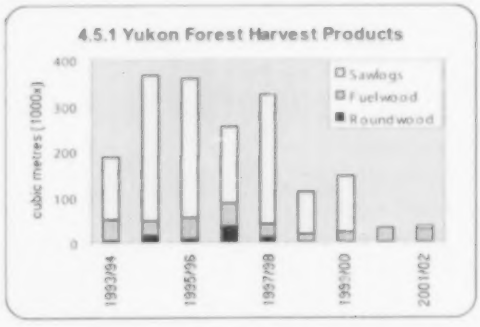
What is being done about it?

- On April 1, 2003, the administration and control of water, land and natural resources, including mineral resources and contaminated mine sites, will be transferred from Canada to the Government of Yukon in accordance with the Devolution Transfer Agreement (DTA).
- In 1998 the Mining Environment Research Group (MERG), a cooperative working group made up of government agencies, mining companies, Yukon First Nations and non-government organizations, formed with a goal to promote research into mining and environmental issues in the Yukon. The group identifies priority areas for research and funds projects that work to reduce negative environmental effects from mining operations. Non-technical reports of project results are provided for general public consumption.
- The Geology Program, a joint venture of the Yukon and federal governments, carries out geoscience research in the Yukon and disseminates information to industry and the public.

4.5 LAND USE - FORESTRY
(see also 6.2 Ecosystems - Forests)

What is happening?

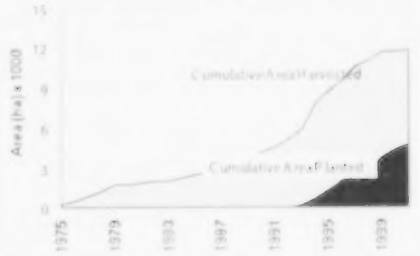
- The Yukon is divided into 13 separate watershed-based management units. The most productive forest are concentrated in the southeast Yukon with the harvest potential gradually diminishing westward and northward. The promary marketable species are white spruce and lodgepole pine.
- Timber harvesting increased significantly in the early 1990s, peaked in 1994/95 and tapered off in 1999. This activity is reflected in the forest product volumes shown in Figure 4.5.1.



- A small volume of wood harvested in the Yukon is processed into value-added, niche forestry products. Products from Yukon mills include mouldings and tongue and groove siding.

- Community-based forest planning processes, which include both public and settlement land, have begun with the Teslin Tlingit Council and Champagne & Aishihik First Nations. In southeast Yukon, the Kaska group of First Nations will be involved in collaborative forest management planning.
- On April 1, 2003 the responsibility for forestry will be transferred from DIAND to the Government of Yukon under the Devolution Transfer Agreement (DTA).
- A forest renewal program was initiated in 1993, using funding provided through a surcharge assessed for each cubic metre harvested. The reforestation charge is calculated yearly and is based on the actual cost of reforestation activities. The charge in 2002 was $6.60 per cubic metre harvested.
- Figure 4.5.2 shows the cumulative area harvested and planted in the Yukon. A steeper curve indicates a higher rate of harvesting or planting. Over seven million seedlings have been planted to date through the forest renewal program.

Figure 4.5.2 Forested Land Harvested and Planted in the Yukon (1975-2001)



Why is it happening?

- Approximately 60 percent of the Yukon is covered by forest. Of this area, less than 25 percent is capable of producing economical timber.
- Across the Yukon there is a demand and need for strategic forest management planning to ensure the wise use of the limited, but renewable resource.
- First Nations have the ability to undertake forest management planning for settlement lands under First Nation Final Agreements (FNFAs).
- Renewable Resource Councils as per FNFAs, may make recommendations on forestry planning and policy development.

Why is it significant?

- Yukon's boreal forests may be as resilient as coastal forests but they are slower growing and may, therefore, take longer to recover from a major disturbance such as fires or a spruce beetle infestation.
- As a result of devolution, there is an opportunity for a review of forestry management under the Government of Yukon.

What is being done about it?

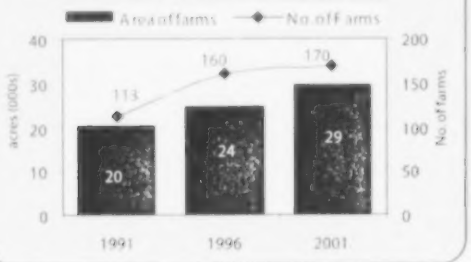
- Changes were made to the federal Timber Regulations in 2001, which provided for market-based stumpage, a broader range of permit options, and revised the permit application requirements and approval process.
- The Government of Yukon has committed to the development of new forestry legislation to replace the former federal Timber Regulations. To begin this process, the development of a forest policy framework in collaboration with First Nations and Renewable Resource Councils has been initiated.
- The Government of Yukon sponsored the multi-stakeholder Yukon Forest Summit in April 2001 to help form a long term vision for forest management and development in the Yukon.

4.6 LAND USE – AGRICULTURE

What is happening?

- Gross agriculture sales in 2000 totalled $4,194,864, representing a 19 percent increase from 1996.
- As shown in Figure 4.6.1, the number of farms increased by six percent between 1996 and 2001. The area of farm land increased by 20 percent and the average Yukon farm size increased by 12 percent, during this time period.
- An estimated 118 sq km (1.8 percent of Yukon's 6,680 sq km of arable land) has been disposed of for agriculture. This accounts for 0.02 percent of Yukon's total land area.
- Twenty new agriculture land titles were issued in 2000/01.

Figure 4.6.1 Number and Area of Farms in the Yukon -- 1991 to 2001



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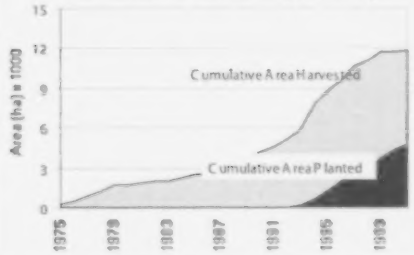

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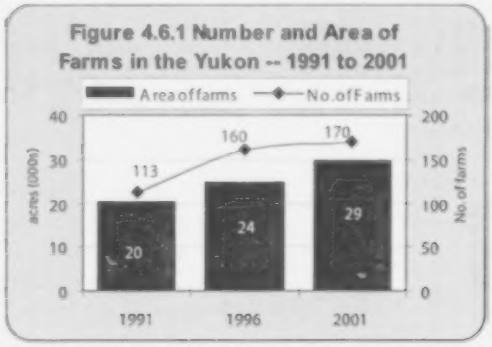
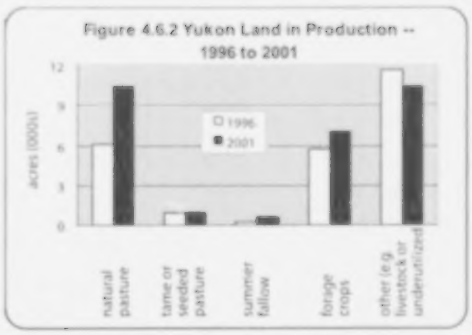


- In 1999, 40 percent of land that had been disposed of, for agricultural use, was actually being used for farming. This figure was based on an aerial survey of farms in the Whitehorse area. Current estimates of land utilization for farming are between 60 and 65 percent, based on agriculture production, investment and land use statistics.
- As shown in Figure 4.6.2, there was a 24 percent increase in agriculture land used for growing forage crops, which still lead the development of agricultural lands. "Other" includes all other uses of agriculture land such as livestock and underutilized land-land not being used for agriculture.
- Livestock production was down in 2001 after previous slow and steady growth. Overall green-



house production increased from 1996. There has also been a 72 percent increase in natural land used for pasture.

- Climate data on growing degree days and frost free period collected at the Takhini Forestry Farm Demonstration Site since 1995 are used to calculate agroclimate classification. Calculations each year have indicated that the site continues to have an Agroclimatic Class 5 rating.
- Note: The definition of an agricultural operation in the Yukon was expanded in 1991 to include: game farming; breeding sled dogs; horse outfitting and rigging; and harvesting indigenous plants and berries.

Why is it happening?

- Yukon agriculture is a growth industry. There are now a sufficient number of farm operations to make Agriculture Census statistics more useful and accurate as a tool to measure the growth.
- Agricultural land allocation is considered through land use planning processes and new land titles are only issued in association with approved farm development plans.
- Although more agriculture land is estimated to be utilized for farm purposes than in 1999, under-utilization is still a significant problem. The under-utilization statistic is affected by the disposition of new land that has not yet been developed for agriculture.
- The industry is not without its challenges. There are climatic and geographic limitations to Yukon's agriculture industry especially for growing crops. Agriculture is generally limited to the major river valleys and suitable for forage and cold hardy crops only. Most of the Yukon is close to the limit of arable agricultural land, especially due to short and variable frost-free growing seasons.
- Production such as some livestock, egg and greenhouse crops have more growth potential because of fewer climatic and geographic limitations.
- Although some changes in regional climate data are measurable in some parts of the Yukon, anecdotal evidence suggests there is a lot of variation in local climates. Agroclimate class data, generated from climate data collected at the Takhini Farm Demonstration Site may conceal changing climate trends because it isn't primary data. Provided the thresholds are accurate, agroclimate class data could, over time, provide a measure of the significance of climate change to agriculture.

Why is it significant?

- The agriculture industry is important as a means of diversification and import substitution in Yukon's economy, which in turn has a positive environmental impact through reduced goods transport and likely better food and product quality. For example 20 percent of eggs consumed in the Yukon are now from local producers.
- There are also significant economic spin-offs through farm machinery sales and maintenance and construction of farm buildings.
- There are challenges associated with the impacts of agricultural land conversion on wildlife and other land users, particularly in the Whitehorse area, where 80 percent of Yukon's farms are located. Area land use planning has been effective in identifying and working to balance land uses and the land application review process addresses technical issues.
- There are also risks of disease transmission to wildlife from game farm animals.
- As devolution is implemented, all agricul-ture land applications will require an environmental assessment.
- The impact of a changing climate on Yukon's agriculture industry is challenging to predict.

An estimated 118 sq km (1.8 percent of Yukon's 6,680 sq km of arable land) has been disposed of for agriculture.

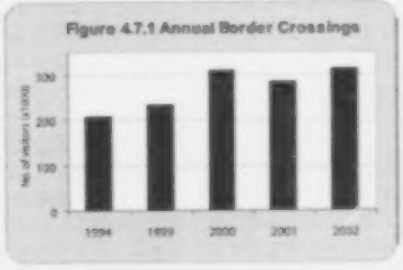
Although more agriculture land is estimated to be utilized for farm purposes than in 1999, under-utilization is still a significant problem.

What is being done about it?

- The Agriculture and Grazing Lease policies were evaluated in 2001. Review and revisions are expected to be completed in 2003.
- A Risk Management Agreement was signed with Canada in June 2001 to allow federal and territorial funds to flow to farmers for forage crop losses suffered in 2000, when half of the harvest was lost to heavy rains.
- In June 2001, a commitment was made by federal, provincial and territorial Ministers of Agriculture to develop a National Agriculture Policy Framework (APF) to guide the future direction of agriculture and the agri-food sector. The APF agreement was signed in 2002.
- In January 2001, a surveillance program for chronic wasting disease was initiated for game farmed elk in the Yukon.
- An Agriculture Products Directory was produced for the first time in 2002.
- The Government of Yukon Agricultural Branch has operated the Takhini Forestry Demonstration Farm since 1988 to test varieties and cash crop profitability, investigate soil conservation techniques and measure grain maturity.

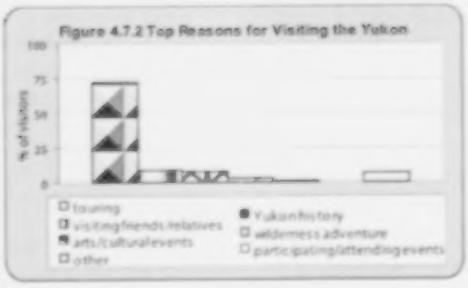
A strong component of Yukon's tourism trade continues to be concentrated along major transportation routes but opportunities for growth target the wilderness adventure and learning niche markets.

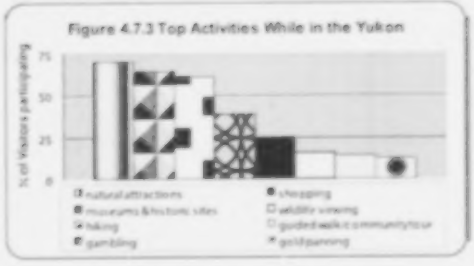
4.7 LAND USE - TOURISM



What is happening?

- The number of visitors to the Yukon is gradually increasing over time, as shown in Figure 4.7.1. Non-resident tourism revenue increased by 22 percent between 1998 and 2000.
- As shown in Figure 4.7.2, by far the top reason for visiting the Yukon is "touring." A strong component of Yukon's tourism trade continues to be concentrated along major transportation routes. These visitors are travelling in tour buses or private vehicles and not venturing far off the road. The road-side views are an important contribution to their overall experience. Forty-three percent of visitor groups stay in hotels or motels and 39 percent stay in campgrounds.





- Figure 4.7.3 indicates that the top visitor activities include natural attractions, shopping, history, and wildlife viewing.
- The demand for accessible and safe viewing sites and educational centres, such as Swan Haven and Dempster Interpretive Centres, is increasing. (see also 5.3.7 Wildlife Values).
- New niche markets, that include learning-based, winter and extreme wilderness adventure travel, are being actively developed in the Yukon. The Yukon College's Summer Institute and English as a Second Language Tour programs and the 2002 Raid the North adventure race are examples of programs that are tapping into these new markets.
- Off-road wilderness travel is increasing in the summer and seems to be increasing in the winter with visitors interested in activities such as dog sledding and northern lights viewing.
- The vast majority of wilderness-based trips are paddling or boating adventures followed by hiking. Hunting and fishing make up a much smaller percentage of these trips but account for higher percentage share of expenditures. Sixty percent of wilderness-based trips are commercially guided.

Why is it happening?

- The events of September 11, 2001 and the uncertainty in the Middle East have been detrimental to overseas travel to Canada, including the Yukon. However, vehicle traffic and the number of U.S. visitors increased since September 11 throughout Canada, including the Yukon. Overall Yukon tourism was up in 2002 but some areas, such as tour bus travel was down.

- The ecotourism market ranging from road accessible wildlife viewing to extreme wilderness adventure travel is a growing global market. Educational and cultural tourism programs and authentic destinations are also in high demand. The Yukon has many natural attributes that fit this type of tourism.
- Efforts are being made by government and tourism partners to keep visitors here for a longer time, grow year-round destination markets and target a broader range of niche markets.

Why is it significant?

- Non-resident tourism contributed $164 million to Yukon's economy in 2000.
- Yukon tourism strategies, developed with industry partners target high yield, as opposed to high volume markets, which allows for a manageable increase in tourism numbers.
- Yukon's natural attractions, including uninterrupted roadside views are the reason visitors come to the Yukon.
- As tourism markets change, different environmental impacts will have to be anticipated and managed. The management of environmental impacts from independent wilderness travellers requires a different set of tools than the impact management of highway corridor travellers.

What is being done about it?

- The Yukon Wilderness Tourism Licensing Act, which came into force in 1998, requires operators to adhere to principles of no trace camping and provide wilderness trip reports. A code of ethics was developed by and for wilderness tourism operators.
- A Yukon wilderness tourism capacity study will be completed in the fall of 2003 to better understand, anticipate and respond to industry and environmental needs as Yukon tourism markets grow and change.
- Efforts to map visitor use, especially for key Yukon waterways, are also underway. Along with these efforts, Yukon's Department of Tourism and Culture is working with the industry to identify appropriate land bases for commercial operations.
- Along with these efforts, Yukon departments of Energy, Mines and Resources (Lands) and Tourism and Culture will begin work with industry on a Commercial Wilderness Outfitters Policy. This process will include consultation with First Nations and interested Yukon people.
- Infrastructure needs for new wilderness viewing sites are being examined, in response to increasing demand for accessible sites by Yukon people and visitors. Environment and Heritage Branch coordinate on various interpretive projects to ensure information is consistent, accurate and reflects reccomendations in Highway interpretive strategies.
- Yukon's Department of Tourism and Culture recently released the Tourism Yukon Product Development Strategy for 2003-2005, which provides a road map for matching tourism products with key tourism marketing strategies.

The top visitor activities include natural attractions, shopping, history, and roadside wildlife viewing.

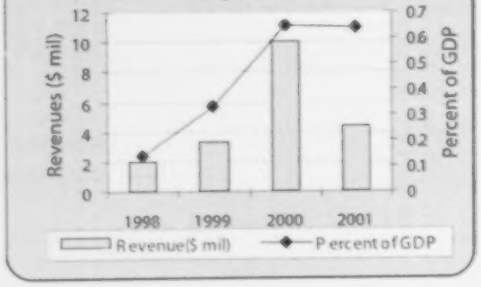
4.8 LAND USE - OIL & GAS

What is happening?

- Under Yukon's Oil and Gas Act (YOGA) there is a rigorous five step process that must be completed before oil and gas rights can be issued. It includes preliminary multidisciplinary assessments to determine the significant conservation interests and government-to-government consultation with First Nations. This process takes about one year to complete.
- Between 1999 and 2001, the Government of Yukon issued three oil and gas disposition permits for exploration in Eagle Plains and one permit for the Peel Plateau, for a total work commitment of $24.5 million.
- Under YOGA, the Government of Yukon receives royalties from the production of oil and gas. There are two producing gas wells at the Kotaneelee gas plant in southeast Yukon. As shown in Figure 4.8.1, oil and gas royalties tripled between 1999 and 2000 but have not exceeded one percent of Yukon's Gross Domestic Product (GDP) since YOGA was enacted in 1998.

Yukon tourism strategies, developed with industry partners target high yield as opposed to high volume markets.

Figure 4.8.1 Yukon Oil and Gas Royalties



Oil and gas royalties tripled between 1999 and 2000 but have not yet exceeded one percent of Yukon's Gross Domestic Product (GDP).

- All oil and gas activity-exploration, well drilling, production and export-needs to be licensed under YOGA. Since 1998, 18 Geoscience Exploration Licences have been issued for exploration programs such as seismic surveys and geological mapping programs.

- Prior to 1998, when oil and gas was under federal authority, 71 wells were drilled between the 1950s and the 1980s. No new oil and gas wells have been drilled under Yukon authority.
- The dispositions or licences shown in Table 4.8.1 were issued by the federal government and are grandfathered under YOGA.

Table 4.8.1 Federal government-issued Licences

Disposition	Number	Location
Significant Discovery Licences	7 2	Eagle Plains Liard Plateau
Exploration Licences	2	North Coast
Production Leases	4	Kotaneelee

Yukon's gas reserves are estimated to be more than 20 trillion cubic feet.

- From December 1998 to November 2002, 73.2 billion cubic feet of gas has been produced and exported from Kotaneelee. To allow this, four Export Licences have been issued.
- The potential of Yukon's oil and gas reserves are characterized, first, through resource assessments carried out by the National Energy Board (http://www.neb.gc.ca/) and the Geological Survey of Canada (http://www.nrcan.gc.ca/gsc/) in cooperation with the Government of Yukon. Initial assessments of Yukon's eight sedimentary basins were completed by 2001. Assessments have been updated for four of the basins since 2002.
- Based on the updated assessments, the Yukon's gas reserves are estimated to be more than 20 trillion cubic feet, more than doubling the previous assessment-based estimates. Oil reserves are estimated at over 900 million barrels.

Why is it happening?

The Yukon's oil and gas regime has been developed with a goal to minimize environmental risks.

- Since the Government of Yukon took over ownership and began management of the resource by enacting YOGA in 1998, oil and gas development has become a much higher economic development priority for the territory.
- However, Yukon's oil and gas basins remain relatively unexplored. Global oil and gas demand and the future possible construction of a major gas pipeline through the Yukon or the Mackenzie Valley will affect the development of Yukon's own oil and gas resource base and distribution network. In addition, the completion of outstanding land claims, the promotion of the resource potential, the recently completed resource assessments and ongoing industry exploration work will all influence the timing and extent of the development of Yukon's oil and gas resources.
- There can be significant environmental risks associated with oil and gas development, particularly to do with impacts on wildlife habitat, waterways, permafrost and traditional activities. The Yukon's oil and gas regime has been developed with a goal to minimize these risks including requiring industry to: apply for a licence and complete an environmental assessment of all oil and gas activity; provide a financial deposit for abandonment and reclamation work and, negotiate a Benefits Agreement for training, employment and business opportunities. In addition, step one of the disposition process requires the government to complete consultation with Yukon people and those First Nations who have traditional territories in the areas under consideration.

Why is it significant?

- The economic benefits of oil and gas development could be significant to the territory. Benefits include increased royalties, direct and indirect employment and spin-off businesses. The industry estimates there are 2.5 indirect jobs for every direct job in the industry.
- In provinces such as Alberta and Saskatchewan, companies have access to a larger province-wide land base to apply to do oil and gas work. Yukon's seismic line density is a fraction of Alberta's.
- Global Positioning System (GPS) technology and small portable drills have helped to reduce the environmental footprint of oil and gas exploration practices. In addition, directional drilling allows multiple wells to be drilled from one location.
- Oil and gas production contributes to greenhouse gas emissions but in the Yukon emissions for the oil and gas sector are limited to the Kotaneelee facility; production contributes fewer emissions than consumer use of oil and gas for transportation, heating and electricity. (see also 2.1 Drivers of Climate Change).

What is being done about it?

- The Yukon Oil and Gas Act (http://www.emr.gov.yk.ca/Oil_and_Gas/Legislation/act.htm) was passed by the Yukon Legislative Assembly and received royal assent in November of 1998. It is unique because it provides for a common regime with First Nations, who have settled land claims.
- Establishment of a Yukon oil and gas regime is a complex process that includes the development of policies, regulations, programs and processes under YOGA to effectively manage resource dispositions, licensing, exploration, facilities, production, pipelines, environmental risks and royalty collection. Development and implementation of the regime is on-going.

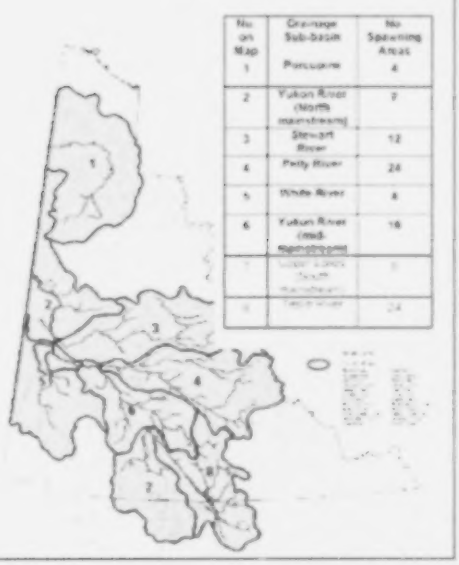
Chapter 5 Fish and Wildlife

5.1 SALMON

What is happening?

- Chinook, chum and coho salmon are found in the Yukon River drainage. The distribution of chinook salmon is the most extensive, as shown in Figure 5.1.1.

Figure 5.1.1 Yukon River Drainage Map and Chinook Salmon Distribution



No. on Map 1	Drainage Sub-basin Porcupine	No. Spawning Areas 4
2	Yukon River (North mainstream)	7
3	Stewart River	12
4	Pelly River	24
5	White River	8
6	Yukon River (mid-mainstream)	16
7	[illegible]	5
8	[illegible]	24

- Chinook, sockeye and coho salmon, along with several sub-populations are found in the Canadian portion of the Alsek River drainage.
- Sub-populations may adapt to local habitat and are usually partially isolated and genetically different from other populations. They include: the chinook salmon stock originating from the Klukshu River; "early run" sockeye salmon arriving at the mouth of the Klukshu River before August 15; and "late run" sockeye arriving after August 15.
- Although escapement returns (the number of salmon returning to their spawning grounds) in many of the salmon runs were up in 2001 and 2002, some of the lowest returns for all of the runs have been recorded since 1998, as shown in Figures 5.1.2 to 5.1.4.
- Table 5.1.1 provides a summary of the state of salmon stocks in the Yukon and Alsek river drainages. Overall, Yukon's salmon escapement returns are declining, except for some species in the Alsek River basin.

Figure 5.1.2 Esimated Total Run Size of Canadian-origin Upper Yukon Chinook Salmon: 1980 to 2002

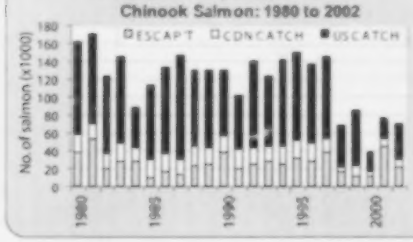


Figure 5.1.3 Estimated Total Run Size of Upper Yukon River Chum Salmon: 1987-2002

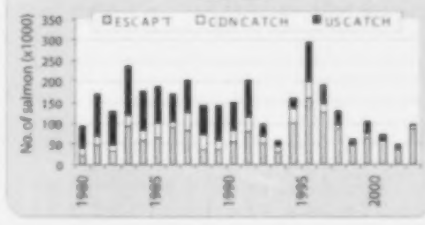
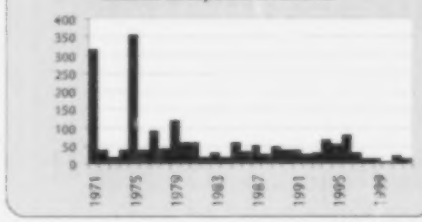


Figure 5.1.4 Porcupine River Chum Salmon Escapement Returns



- Data collected since 1999 indicate that Yukon chinook salmon are frequently heavily infected by a fungal parasite called *Ichthyophonus*. Infection appears to increase as fish progress on their upstream migration.

Why is it happening?

- There is considerable variation in salmon production between years due to changes in the year class strength (the number of spawning fish by age class) and environmental conditions.
- Chum salmon tend to return from the ocean to spawn every four years. Chinook salmon's spawning cycle is more variable. There is often a cycle of high/low escapement returns, reflecting the year class strength numbers, within these time cycles.

Overall, Yukon's salmon escapement returns are declining, except for some species in the Alsek River basin.

An expanded study of the management and conservation implications of *Ichthyophonus* is underway.

Table 5.1.1 Summary of the State of Salmon Species in the Yukon and Alsek River Basins

River Drainage	Species	Status of Stocks	Escapement Goal	Trends	Management Actions Taken
Alsek	chinook	Moderate	1,100	Below average returns since 1998. In 1995 there was a record high of 5679.	
Alsek	early run sockeye	Conservation concern Poor returns	2,500	Major fluctuations since 1976. Poor returns since 1998, except record return in 2002.	2002 relaxed restrictions
Alsek	late run sockeye	Below Average	8,500	Major fluctuations since 1976. Below average returns since 1998, except high 1998 and 2002 returns.	2002 relaxed restrictions
Alsek	coho	Moderate		Since 1998 trend towards increasing stock. In 2002 there was a record return.	2001 and 2002 relaxed restrictions
Yukon	chinook	Conservation concern Declining	28,000	Below average returns since 1998; decreasing trend and continued uncertainty with respect to marine survival.	Further study of *Ichthyophonus* parasite
Yukon	chum	Conservation concern Declining	60,000 to 80,000	Below average returns since 1998; decreasing trend and continued uncertainty with respect to marine survival.	A major closure of Alaskan fisheries was implemented in 2002
Porcupine	chum	Conservation concern Declining	50,000 to 120,000	Below average returns since 1998. A record low of 5053 returns recorded in 2000. Decreasing trend and continued uncertainty with respect to marine survival.	Restrictions on the Old Crow subsistence fishery were implemented in 2002

- Escapement returns may be affected by a range of factors including: fishing pressure by humans; predation from freshwater, marine and terrestrial wildlife; water levels and temperature; sediment load fluctuations; and diseases.
- Long term climatic events like the Pacific Decadal Oscillation (PDO) and short term warming events like El Niño and cooling events like La Niña influence oceanographic conditions and salmon production along the North American coast.
- Fisheries biologists speculate that ocean conditions (poor marine survival) may have caused the recent decline in salmon numbers.
- Changes in climate conditions are being observed in the Bering Sea-the rearing area of Yukon River salmon-but it is unclear at this point whether this is the result of a longer term decadal regime shift or a short term climatic event.

The Yukon River Salmon Treaty was signed on December 4, 2002 to cooperatively rebuild and conserve Canadian-origin salmon stocks.

Community View

- Most of the people asked in Teslin, Mayo and Whitehorse/Laberge have found a decrease in the abundance of salmon.
- One person in Faro/Ross River reported a decrease in king salmon in the Ross and Pelly Rivers, noting the salmon are smaller than before.
- An increase in chum and chinook (also called king) in the Dawson area of the Yukon River was reported by one respondent.
- In Old Crow, one person said there was a decrease in chum, chinook and coho in the Porcupine River.
- Changes in the fish habitat occurring due to erosion was also reported.
- One person in Carmacks reported the number of chinook has decreased.
- Only a few people found a fungus in their salmon. Overall, no community agreed, on the whole, that there was any fungus seen at all. One person in Dawson saw an increase in cysts/worms in salmon and one person found more fungus in king and chum bellies caught down river.
- In Carmacks, one person found deformed salmon.

- *Ichthyophonus* could result from stress related to unfavourable environmental factors such as increased water temperature (see also 2.3 Impacts of Climate Change)

Why is it significant?

- Yukon and Alsek river salmon are important to aboriginal, commercial, sport and domestic fisheries in the Yukon Territory.
- Salmon are also an important part of the ecosystem, providing a key food source for bears, eagles and other predators as well as bringing nutrients from the marine to freshwater and terrestrial environments.
- Recent concerns over escapement numbers have resulted in closures and/or restrictions to aboriginal, commercial, sport and domestic fisheries within the Yukon River drainage.
- If escapement returns remain low for a consecutive number of years, then stocks can become depressed and take a long time to recover.
- Yukon chinook salmon may be the first wild population of pacific salmon documented to have *Ichthyophonus*. The parasite causes a change in the flesh, which renders some fish unmarketable. It may also result in pre-spawning mortality.

What is being done about it?

- Two Canada-United States treaties are in place to rebuild and conserve salmon stocks and provide benefits to fisheries in both countries. Spawning escapement goals and total allowable catches are co-operatively established under these treaties. The Pacific Salmon Treaty signed in 1985 and amended on June 30, 1999

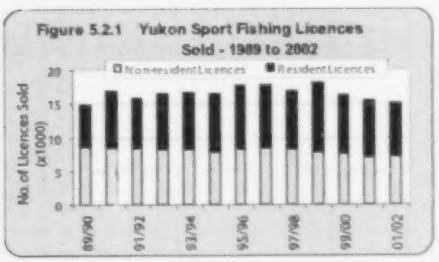
includes the Alsek River drainage. The Yukon River Salmon Treaty, signed on December 4, 2002 as an annex to the Pacific Salmon Treaty focuses on the upper Yukon River system and Porcupine River system.

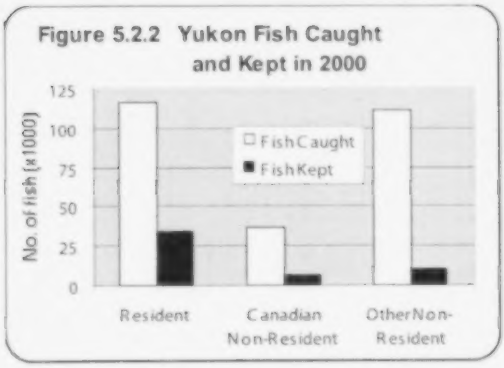
- The Yukon River Salmon Restoration and Enhancement Fund was established to fund programs and projects targeting Canadian-origin salmon stocks in the Yukon River drainage. The United States contributes US $1.2 million annually to the fund.
- Under the Northern Boundary and Transboundary River Restoration and Enhancement Fund, interest from the US $75 million principal, provided by the United States, will be used for salmon management and habitat research.
- Meeting spawning escapement goals is critical to ensuring effective Fisheries management. Monitoring tools include aerial surveys, fish weir counts, and mark and recapture techniques.
- An expanded study of the management and conservation implications of *Ichthyophonus* is underway.

5.2 FRESHWATER FISH

What is happening?

- In the Yukon, there are commercial, domestic and First Nation subsistence food fisheries along with sport or recreational angling. Sport fishing accounts for the vast majority of the freshwater fish harvested.
- As shown in Figure 5.2.1, the total number of licences sold increased marginally during the 1990s and declined modestly in the early part of this decade. There is a fairly even split between non-resident and resident anglers.

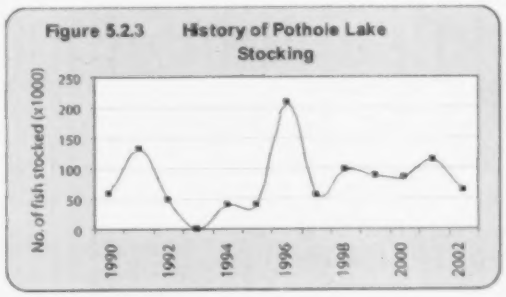




Sport fishing accounts for the vast majority of the freshwater fish harvested.

- Data for Figure 5.2.2 was collected during the 2000 Yukon Sport Fishing Survey. Of the total fish caught, 19 percent were kept and the rest were released. Yukon resident anglers accounted for 44 percent of the total fish caught and kept 67 percent of the total harvested. Non-resident, non-Canadian anglers caught 42 percent of the total but kept only 21 percent. Non-resident Canadians kept only 13 percent of the total. Arctic grayling and lake trout were the most widely caught species. Arctic grayling accounts for the highest number of fish kept.
- The stocking of pothole lakes (lakes with no inlet or outlet) was initiated in the early 1940s during the building of the Alaska Highway. Today the goal of the stocking program is to reduce pressure on native fish stocks, especially lake trout. As shown in Figure 5.2.3 stocking efforts have varied over the last decade. In 1996, a large number of local hatchery-raised chinook salmon were added to the stocking program.

Of the total fish caught in the Yukon in 2000, 19 percent were kept and the rest were released.



Why is it happening?

- The slight decrease in sport fishing licence sales during this decade reflects an overall Canada-wide downward trend in recreational fishing. In the Yukon the biggest decrease is the number of active Yukon resident anglers.
- Sport fishing licence sales are also dependent on weather conditions and the state of the tourism industry.
- According to the five-year recreational fishing survey, last completed in 2000, anglers are catching less and keeping less fish than in previous years. Anglers are using live release techniques more now than five years ago.

The slight decrease in sport fishing licence sales during this decade reflects an overall Canada-wide downward trend in recreational fishing.

Anglers are using live release techniques more now than five years ago.

Community View:

- In Carcross and Tagish, most of those asked have reported catching less lake trout. The majority asked in five other areas report they are catching the same amount.
- Of those asked in Carmacks, most have reported more cysts/worms found in the fish. A majority of those asked in six other communities said there has been no change. One person in Carcross noticed an increase in white worms in the guts, others say they have heard there are more but have not seen them. One person in Beaver Creek found more parasites in whitefish and cysts in grayling. Another, in Carmacks, reported finding stomach worms in jackfish.
- No increase in deformities found in fish were reported by a majority of those asked in any community, although one individual in Mayo found more fin damage and predator scars, and another person found swollen livers in ling cod in the Pelly Crossing area. Two people in the Lake Laberge area also said they found more deformities in fish. One of them described a change in head size and deformed gills. Someone in Carcross reported that tagged fish are mushy around the tag area and have blisters near their tails. One person in Carmacks found spinal defects in some fish.
- Most of those asked in Mayo and Carcross/Tagish have found that fish are changing their habits and locations. In Mayo, both trout and grayling are reported to have changed their locations and trout have been found at different depths. In Carcross, pike are now found all over the lake, and the timing of the arrival of herring is later than usual. Someone in Beaver Creek said the salmon and grayling have changed their locations due to silt in the river since 1995. A Watson Lake resident reported finding pike moving into trout habitat, while someone in Pelly Crossing said the whitefish have moved from their traditional creeks as streams are drying up.

Why is it significant?

- The number of licensed anglers in the Yukon has been slightly declining this decade but numbers are relatively stable in comparison with some Canadian provinces, where interest in fishing has declined dramatically.
- The number of fish caught and the number of fish harvested has declined over the years, in part, because more anglers are practising live release techniques. Studies show that survival rates for released fish can be very high. Live-release is most valuable when it is used as a tool for selecting only the best fish for eating. The mortality rate of released fish is greatly decreased through careful handling, the use of single barbless hooks, the use of artificial lures instead of bait, and cutting lines from deep-hooked fish. Fisheries managers believe that live release is an effective management tool.

What is being done about it?

- Baseline information has been established on fish stocks in approximately 70 lakes in the Yukon.
- Re-sampling of targeted lakes using small mesh gillnet surveys is carried out to establish trends in fish abundance and to determine changes in species diversity in order to better manage the resource.
- The Yukon Territorial Fishing Regulations, under the federal *Fisheries Act* are applied to anglers and the food fisheries. Regulations used to manage fisheries include size and hook restrictions, catch limits, commercial fishery quotas and equipment restrictions as well as closures of specific areas.

5.3 WILDLIFE POPULATIONS & HARVEST

5.3.1 Birds

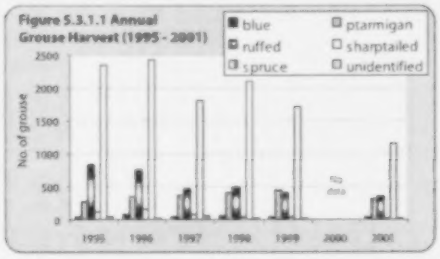
What is happening?

Waterfowl

- The Yukon is the summer breeding home for more than 30 species of waterfowl. Dabbling ducks include American Wigeon, Mallard and Green-winged Teal. Diving ducks include Bufflehead, Ring-neck Duck, and Lesser and Greater scaup.
- Based on the limited surveys completed there are no significant trends in the Yukon's waterfowl numbers. Survey numbers vary annually and determination of trends and changes in trends require long-term data.
- On the Old Crow Flats, Northern Pintail numbers have remained fairly constant, Northern Shoveler numbers have been slowly increasing and Scoter numbers have been variable. Ring-necked Ducks were first observed in the Old Crow Flats area in the 1980s and their numbers are low and variable. [1]
- Between 2001 and 2002, the number of diving and dabbling ducks decreased by 21 and 22 percent, respectively in Old Crow Flats. In southern Yukon, the number of diving and dabbling ducks decreased by 17 and 21 percent, respectively.[2]
- Pairs of dabblers and divers are at 57 and 40 percent of 1991 levels, respectively. Total numbers of dabblers and divers are at 97 and 78 percent of 1991 levels. [2]

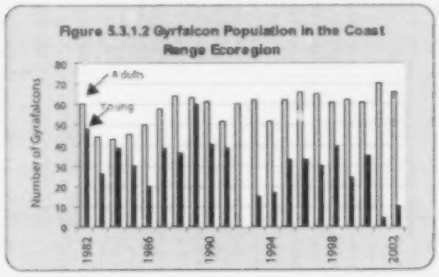
Grouse

- In the Yukon, there are 7 species of grouse, three of which are referred to as ptarmigan. As seen in Figure 5.3.1.1, the annual harvest of each species has been declining since 1996, which follows the decline in the normal 10-year population cycle.



Gyrfalcon

- The Gyrfalcon is the largest species of falcon and breeds in Arctic and sub-Arctic regions, including the Yukon.
- The Gyrfalcon population dynamics appear normal. As shown in Figure 5.3.1.2, the adult population in the BC and Yukon Coast Range Ecosystem is stable, while the "young" population, following normal cycles, has declined dramatically in 2001 and 2002 surveys.



Owls

- Yukon's boreal forests are home to several species of owls including Great Horned, Boreal, Northern Hawk, and Great Gray. The BC-Yukon Nocturnal Owl Survey has a growing number of recording routes, and found that there was an 83 percent reduction in Great Horned Owl callings between 2000 and 2001, followed by a modest recovery in 2002. Boreal Owls showed an 8-fold increase in callings between 2001 and 2002.

Why is it happening?

Waterfowl

- The annual roadside waterfowl survey in southern Yukon has been carried out for just over a decade. This is not yet a long enough time period to provide a foundation for population trend data. The US Fish and Wildlife Service's annual aerial survey is carried out on one day every year. As a result, the count may be influenced by weather conditions that day or the timing of spring weather. There was an unusually late spring in 2000, 2001 and 2002 so duck migrations to the Old Crow Flats area may have been delayed.
- In some years, higher numbers of species such as Northern Pintail in Old Crow Flats may be associated with drought years in the Prairies, which caused them to search out new areas for suitable breeding habitat.
- There is concern that Old Crow Flats is experiencing a drying trend. To date, there is no indication of a significant impact on waterfowl populations.

Grouse

- Grouse (including ptarmigan) populations are cyclical, linked to the Snowshoe Hare's 10-year population cycle. Population peaks are expected around 2005.

Community View

- Of those asked in Carcross/Tagish, Beaver Creek, Faro/Ross River and Pelly Crossing areas, most people said they had noticed more species of birds over-wintering.
- Individuals reported swans and juncos in Tagish and robins in Whitehorse, while another person noticed the crossbills at lower than usual elevations around Dawson.
- Red-winged Blackbirds and Morning Doves were reported seen by one person in Faro.
- At Beaver Creek, one person saw Golden Eagles in winter and another saw Pine Grosbeaks.
- Someone in Burwash/Destruction Bay area has seen Mallards during the winter and possibly cormorants, as well.
- American Robins were seen in Teslin in December 2002 and in Faro, one person said robins are either arriving very early or spending the winter there.
- One person reports seeing geese at Lake Laberge after Christmas, 2002.
- Five communities reported no change in the number of bird species over-wintering.
- The majority of people asked in five communities (Mayo, Carcross/Tagish, Beaver Creek, Old Crow and Pelly Crossing) reported migrant birds staying around later in the fall. Some people said the birds are taking a longer time to arrive in spring and to leave in fall.
- One person in Carcross said there are fewer numbers and species of birds at his feeder in spring, and that the elders are saying there are some little birds not coming back anymore.
- One respondent in Dawson is seeing fewer cranes each year.
- In Haines Junction, Mountain Bluebirds are decreasing in number, according to one report.
- Most of those asked in nine communities reported finding the same number of dead birds as usual. No communities reported an increase.

Based on the limited surveys completed there are no indications of significant trends in Yukon's waterfowl numbers.

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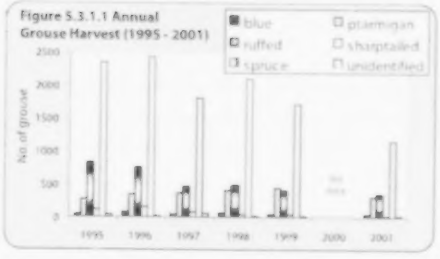

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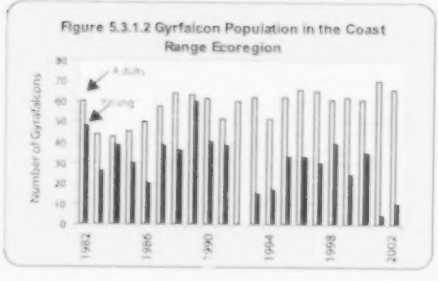

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- One person in Carcross said there are fewer numbers and species of birds at his feeder in spring, and that the elders are saying there are some little birds not coming back anymore.
- One respondent in Dawson is seeing fewer cranes each year.
- In Haines Junction, Mountain Bluebirds are decreasing in number, according to one report.
- Most of those asked in nine communities reported finding the same number of dead birds as usual. No communities reported an increase.

Gyrfalcons

- Throughout much of the Gyrfalcon's range the ptarmigan-especially the Willow Ptarmigan-is their main prey. During low ptarmigan years Gyrfalcons do not breed or may abandon nests. This behaviour is revealed in the 2001 and 2002 numbers of young in Figure 5.3.1.2

A number of important bird surveys are carried out by volunteers while others are part of government monitoring programs

Owls

- Great Horned Owls feed primarily on Snowshoe Hares and, therefore follow the 10-year hare population cycle. The hare population in southern Yukon crashed in 2000. Boreal Owls feed primarily on voles, both of which have 4-year population cycles. The vole population dramatically increased in 2002, according to live-trapping data in the Kluane region and anecdotal evidence. In low years, owls may not breed or call, which affect survey counts.

Why is it significant?

Waterfowl

- The Old Crow Flats are the breeding and moulting grounds for a large number of waterfowl. It is an important wetland both locally and internationally.
- The annual roadside waterfowl breeding survey results, combined with similar surveys throughout North America contribute to better assessment of continental population trends of waterfowl.

Great Horned Owls feed primarily on Snowshoe Hares and, therefore follow the 10-year Hare population cycle.

Grouse

- Only the Willow Ptarmigan is actually monitored. Tracking the grouse harvest provides a tool for monitoring all of the grouse populations. Understanding the grouse population cycles is critical for understanding the population cycles of their prey.

Gyrfalcons

- Gyrfalcons are a good indicator species for tundra habitat because they feed primarily on the Willow Ptarmigan.
- Long-term monitoring of Gyrfalcon in North America has been limited. The work in the Yukon and other territories has been most notable.
- Because most Gyrfalcons live in areas remote from pesticide use and feed on non-migratory prey, they are generally less susceptible to contamination than, for example, the Tundra Peregrine Falcon, which is listed as a species at risk. It is migratory and is more likely to feed on contaminated prey. (see also 5.4 Species at Risk)

During low ptarmigan years Gyrfalcons do not breed or may abandon nests.

Owls

- Great Horned and Boreal owls, because their numbers reflect prey abundance, are good indicators of habitat quality. The BC-Yukon Nocturnal Owl Survey program, if adopted throughout North America, could provide insight into continental owl population trends, while others are part of government monitoring programs.

What is being done about it?

- Annual bird surveys, targeted studies and bird banding initiatives are carried out annually or from time-to-time in order to understand population dynamics, bird behaviour and confirm species ranges in the Yukon.
- A number of important surveys are carried out by volunteers while others are part of government or Yukon College monitoring programs. Yukon volunteers in the annual North American Breeding Bird Survey count the number and types of birds they see and hear along a predetermined route, during the same time period every year. This provides important information about long-term trends in songbirds. The Christmas Bird Count is carried out in various communities by volunteers throughout the Yukon.
- The Canadian Wildlife Service maintains a database of bird sightings in the Yukon using data collected since 1860.

Waterfowl

- Since 1955, the US Fish and Wildlife Service has been conducting an annual aerial survey of 11 major waterfowl breeding areas in Alaska and Old Crow Flats.
- Since 1991, the Cooperative Roadside Waterfowl Breeding Population Surveys have been carried out at roadside wetlands throughout southern Yukon. The surveys are conducted over a five-week period by staff at the Canadian Wildlife Service, Yukon Department of Environment and Yukon College.

Grouse

- Grouse and ptarmigan kills are reported in annual questionnaires by hunters, for the Government of Yukon's Department of Environment. Only the Willow Ptarmigan is monitored in the field through the Biodiversity Assessment and Monitoring Project based at Yukon College.

Gyrfalcons

- Annual spring Gyrfalcon population assessments are carried out through the Yukon Raptor Population Monitoring Project based at Yukon College.

Owls

- Bird Studies Canada initiated the BC-Yukon Nocturnal Owl Survey in 2000 to monitor long-term trends in owl populations. The survey is carried out by volunteers.

5.3.2 *Furbearers*

What is happening?

- The Yukon is home to 14 furbearing mammals that are harvested for their fur.
- Overall the furbearer populations are stable as shown in Table 5.3.2.1

Table 5.3.2.1 Population Trends and Trapping Interest of Selected Furbearing Species

Species	1998 Population Trend	2000 Population Trend	Trapping Interest (2002)
beaver	stable	stable	stable
coyote	slight decrease	stable	low
red fox	slight decrease	stable	low
lynx	increase	stable	low
marten	stable	slight increase	stable
mink	slight decrease	slight decrease	low
muskrat	decrease	decrease	low
otter	slight decrease	slight decrease	low
squirrel	increase	increase	low
weasel	slight decrease	stable	low
wolf	increase	increase	increasing
wolverine	stable	stable	stable

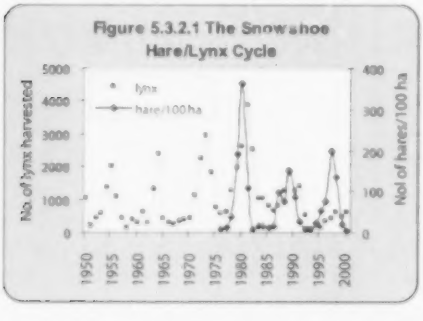
- The annual fur harvest has decreased dramatically between the 1997/98 and 2001/02 harvests as shown in Table 5.3.2.2.

Table 5.3.2.2 Furbearing Species Harvest & Average Pelt Price

Species	Total Harvest		Average Pelt Price ($)	
	1997/98	2001/02	1997/98	2001/02
beaver	312	286	30	27
coyote	30	12	30	37
fisher	3	1	45	45
fox, coloured	36	28	22	46
fox, arctic		3	29	32
lynx	442	214	92	111
marten	5049	1646	43	54
mink	94	37	18	19
muskrat	130	451	3.50	4
otter	11	9	78	91
squirrel	2803	289	1.20	2.20
weasel	40	36	3.30	5.50
wolf	111	141	120	221
wolverine	118	110	199	337
Total	9179	3263		

- Figure 5.3.2.1 shows the population cycles of snowshoe hares and lynx. The lynx data is based on Yukon-wide harvest statistics. The hare data is based on direct monitoring of the spring hare density in the Kluane region.

Figure 5.3.2.1 The Snowshoe Hare/Lynx Cycle



Why is it happening?

- Trapping is still an active area of the economy. Over 400 Yukon people hold trapping licences. There are 340 registered trapping concessions, seven small group concessions held by families or for elders, and eight large group concessions held by collectives from First Nation communities.
- Good species management is advocated by the Government of Yukon and the Yukon Trappers Association and practised by most trappers, as it is in their best interest for long term sustainability of the resource.
- Fur harvest, which is market driven and influenced by other economic factors, remains low; a trend that started in the 1990s.
- Over the past twenty-five years Yukon's fur harvest has fluctuated in value between $200,000 and $1.7 million annually, with an economic spin-off multiplier of 2 to 3.
- Snowshoe hares follow 8 to 11-year population cycles. Lynx, a major furbearer follow this cycle because hares constitute their main food source.

Overall furbearer populations are stable.

Why is it significant?

- The economic, social and cultural value of trapping is significant. It is a winter revenue source in smaller communities when unemployment is traditionally high. Approximately 50 percent of trappers are First Nations, allowing them an economic means to maintain their strong connection to the land.
- Trappers help to provide knowledge that leads to better understanding of the furbearing species and their habitat, which leads to better management.
- The economic spin-offs of the trapping economy are most noticeably felt in the rural communities where many of the trappers reside and purchase the bulk of their supplies.
- Hare cycles affect other species, both predators-coyotes and Great Horned Owls-and prey.

The annual fur harvest has decreased dramatically between the 1997/98 and 2001/02 harvests.

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What is being done about it?

- The Trapping Regulations, under Yukon's *Wildlife Act* were amended in 2001/02 to comply with the Agreement on International Humane Trapping Standards (AIHTS), and included restrictions on leg-hold trap use. The compliance with the AIHTS ensures that trade with the European market is maintained.
- Trap exchanges have assisted trappers by facilitating the change of technology to tested and certified traps such as quick-kill and padded traps, which meet AIHTS.

- Furbearer populations are estimated based on annual monitoring of the harvest, and through trapper questionnaires, which are obtained on a trapping concession basis.
- In 2000, all individuals, under the age of 65 years, were required to graduate from trapper training in order to be eligible to acquire a trapping licence. As of 2002, graduation from trapper training is required for all individuals acquiring or renewing a trapping concession.

5.3.3 *Caribou*

What is happening?

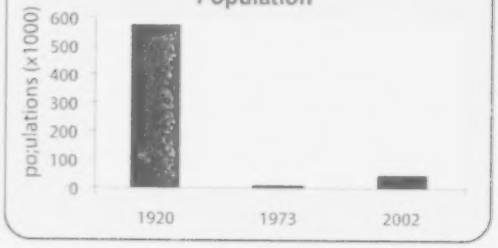
- The estimated woodland caribou population in the Yukon is between 31,000 and 36,000, distributed among 22 herds.
- There are an estimated 196,000 barrenground caribou distributed among three herds. Over 60 percent of the total population belong to the Porcupine caribou herd.
- The caribou ranges are distributed throughout the Yukon as shown in Figure 5.3.3.1. The status of the herd populations vary and are summarized in Table 5.3.3.1. Three woodland caribou herds are declining, 14 herds are stable or increasing and the status of 5 herds is unknown or uncertain. Two barrenground caribou herds are declining and one is increasing.
- The Porcupine herd population reached a peak in 1989 and declined between 1994 and 1998 at a rate of four percent per year. The rate of decline has slowed between 1998 and 2001.
- The near-extirpation of the Fortymile herd population is revealed in Figure 5.3.3.2. In October 2002, for the first time in 50 years, the herd migrated across the Yukon River and crossed the Top of the World Highway, following a historical migration route.
- The declining population of the Chisana herd is shown in Figure 5.3.3.3. The Chisana herd has been included as Specially Protected Wildlife under the Yukon *Wildlife Act*.
- As shown in Figure 5.3.3.4, the annual licensed, non-First Nation caribou harvest remains between 400 and 700.
- In April 2002, COSEWIC (Committee on the Status of Endangered Wildlife in Canada) designated all woodland caribou

Figure 5.3.3.1 Distribution of Caribou Herds

Table 5.3.3.1 Status of Yukon Caribou

Herd	Population Estimate	Trend
Woodland Caribou		
1. Hart River	1,200	Stable
2. Clear Creek	900	Stable
3. Bonnet Plume	5,000	Unknown
4. Ethel Lake	300	Stable
5. Moose Lake	200	Stable
6. Tay River	4,000	Stable
7. Redstone	5-10,000	Unknown
8. Finlayson	4,100	Stable
9. Nahanni	900	Declining
10. Coal River	800	Unknown
11. La Biche	400	Unknown
12. Little Ranchería	1,000	Increasing
13. Wolf Lake	1,400	Stable
14. Aitin	800	Stable
15. Carcross	850	Increasing
16. Ibex	450	Stable
17. Pelly Herds	1,000	Unknown
18. Tatchun	500	Stable
19. Klaza	>500	Increasing
20. Aishihik	1,500	Increasing
21. Kluane	200	Declining
22. Chisana	350	Declining
Barrenground Caribou		
23. Nelchina	33,000	Declining
24. Fortymile	40,200	Increasing
25. Porcupine	123,000	Declining

Figure 5.3.3.2 Fortymile Herd Population



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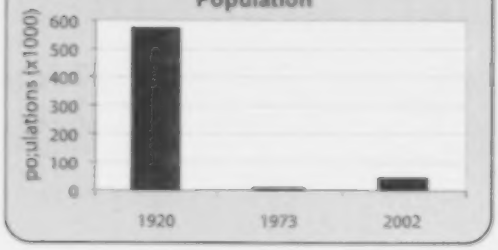


Figure 5.3.3.3 Chisana Herd Population

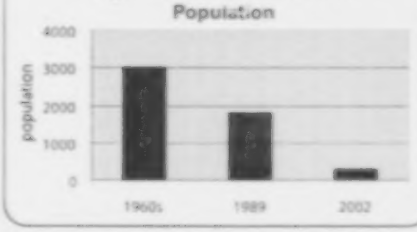
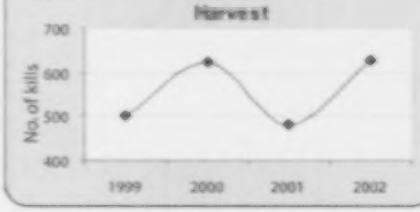


Figure 5.3.3.4 Licensed Caribou Harvest



in Yukon and Northern BC as a Species of Special Concern. (See also 5.4 Species at Risk)

Why is it happening?

- Woodland caribou are managed on a herd basis. Predators and hunting keep caribou densities below their habitat carrying capacity. Based on management experience and case history analysis the Annual Allowable Harvest for a relatively stable, naturally regulated population is estimated at 2 to 3 percent of adults.
- The declining Chisana herd population is the result of poor calf recruitment and adult survival as a result of a high rate of predation.
- The cause of the Fortymile herd decline is a combination of natural decline, overharvest and habitat disintegration as a result of highway construction in the 1960s, followed by high predation rates by wolves. By the 1960s the herd's numbers and range were greatly diminished and they no longer migrated into the Yukon.
- Biologists believe that the recent declining trend of the Porcupine herd is related to weather conditions such as high snow accumulations and shorter summers that are causing an increase in adult mortality. The birth rate is comparable to other herds and harvest levels have remained at an acceptable level.

Why is it significant?

- Conserving and protecting key caribou habitat (e.g. rutting areas, migration corridors, and winter range) is crucial to herd health and abundance.
- Yukon has unique opportunities for wildlife viewing and caribou is one of the most sought after species.
- Caribou meat provides an important food source to Yukon people.
- Without intervention, the Chisana herd could be in danger of extirpation. The return of the Fortymile herd from near-extirpation proves the effectiveness of management efforts including habitat protection, harvest reduction, and re-location of predators. The current Fortymile herd population may be strong enough to grow to more historically-representative population numbers.
- The Porcupine caribou herd has a large range expanding across northern Yukon, Alaska and Northwest Territories. People in communities throughout this area rely on this herd for food, and spiritual and cultural well-being.

Yukon has unique opportunities for wildlife viewing and caribou is one of the most sought after species.

What is being done about it?

- Radio collar studies are conducted to delineate herd ranges. Population trends are measured by annual sample counts during the fall breeding season when herds are mixed and their sex and age composition is evident. Population change is determined by census surveys every 4 to 5 years. Habitat assessments are carried out to determine range productivity and to identify critical areas.
- The barrenground herds are managed under transboundary agreements because their ranges cross the Yukon-Alaska border.
- As the population of the Fortymile herd continues to increase, intensive management efforts are being replaced with monitoring efforts.
- A pilot captive breeding project for the Chisana herd is expected to begin early in 2003. Twenty pregnant females will be captured, placed in a large pen and then released when the calves reach one month of age and are less susceptible to predation.

Caribou meat provides an important food source to Yukon people.

5.3.4 *Moose*

What is happening?

- The estimated moose population is 65,000 to 70,000, distributed throughout the Yukon.
- Overall, moose populations are stable or increasing.

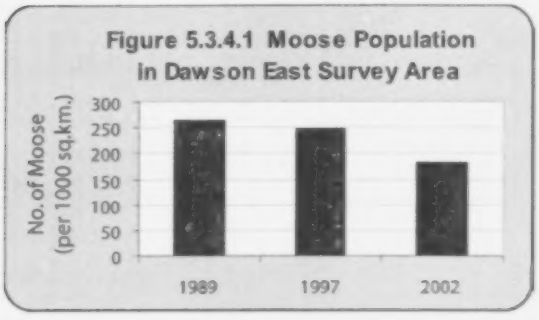
The return of the Fortymile herd from near-extirpation proves the effectiveness of management efforts.

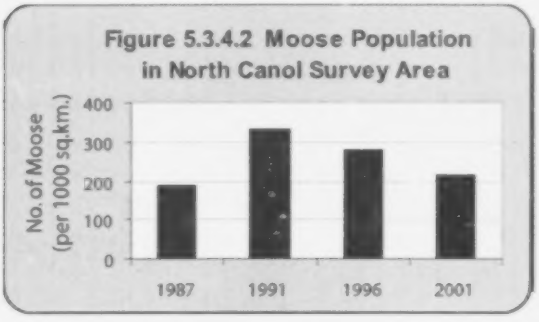
Community View:

- Most of those asked in Carcross/Tagish, Haines Junction, Watson Lake and Carmacks reported a decrease in bull moose sighted.
- The majority asked in Teslin, Burwash, Whitehorse/Laberge, Mayo and Faro/Ross River reported no change.

Without intervention, the Chisana herd could be in danger of extirpation. A pilot captive breeding project the herd is expected to begin early in 2003.

In a few areas as shown in Figures 5.4.3.1 and 5.4.3.2 populations are decreasing. Dawson East is an area south of Dawson City and the North Canol survey area straddles the North Canol Road northeast of Ross River. (Note: Pre-2000 survey results are not



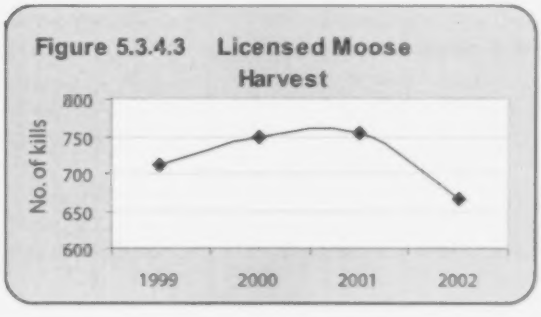


Overall, moose populations are stable or increasing.

completely comparable with 2000 results because of a change in survey techniques).

- Based on moose surveys in 1989 and 2000 moose appear to be expanding their occupation of the North Slope. More moose seem to be over-wintering north of the Richardson Mountains.
- Moose is still the most popular big game animal in the Yukon. As shown in Figure 5.3.4.3, between 600

Moose meat provides a significant portion of Yukon people's food supply.



and 800 moose are harvested annually, not including the harvest by First Nations.

Why is it happening?

- The areas where moose populations are declining are generally more easily accessible by hunters and/or closer to larger populated areas.
- In the 1990s, intensive management and area restrictions were effective in the recovery of area moose populations north of Haines Junction.
- Renewable resource managers estimate that, Yukon-wide, between 2000 and 2,500 moose could be harvested annually and still maintain a stable population. It is likely that, even including the First Nation harvest, the moose harvest is well within this limit.

Why is it significant?

- Moose meat provides a significant portion of Yukon people's food supply. About 550,000 pounds of moose meat are locally harvested every year.
- Moose are widely distributed throughout the territory. However, their numbers tend to be concentrated in shrub habitat near creeks and marshes, which make up a small portion of the Yukon. Although their numbers are healthy, habitat protection is still critical.
- On the North Slope the overall increasing trend in moose abundance could be linked to changes in climatic trends such as temperature and precipitation. Moose and a number of other mammals are thought to have been much less common in the Yukon prior to about the turn of the century. Their northward expansion could be linked to climate change trends.
- Moose are a good indicator species for habitat change and contaminants in the environment.

What is being done about it?

- Systematic moose surveys have been carried out since the early 1980s.
- The Government of Yukon's Department of Environment carries out targeted research such as studying the seasonal movements of moose north of Faro. This work is being done to help address concerns about local harvest rates. It is not known whether moose from surrounding regions move into this area during the rut or stay year-round.
- Hunter education is now mandatory for first-time hunters.

5.3.5 *Grizzly Bears*

What is happening?

- About 30 percent of Canada's grizzly bears live in the Yukon. The Yukon grizzly bear population is estimated to be between 6000 and 7000.
- The grizzly bear is considered a species of special concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). (See also 5.4 Species at Risk.)
- Grizzly bear habitat has not historically been monitored but due to a decrease in human population since 1997, habitat pressures are unlikely in the short-term.
- As shown in Figure 5.3.5.1, a significant percentage-between 15 and 19 percent-of the total annual grizzly mortality, is control kills. The total annual grizzly bear harvest does not include First Nation or Inuvialuit harvest. "Other" deaths such as road strikes of grizzlies remain at 2 or 3 per year.

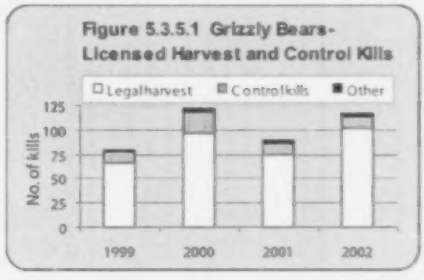


Figure 5.3.5.1 Grizzly Bears-Licensed Harvest and Control Kills

Community View

- Most people asked in Mayo, Beaver Creek and Pelly Crossing reported that bears have been coming out of hibernation earlier in the spring.
- One person in Whitehorse reports seeing a bear still out on Remembrance Day.

Why is it happening?

- The species of special concern status was given to grizzly bears because of the significant decline in the species national range as well as their sensitivity to human activities and their low reproductive rate.
- Control kills are usually carried out if a bear is deemed "human-habituated." This is often the result of a bear becoming conditioned to humans and possibly dependent on them for food.
- Better landfill controls, particularly electric fencing, have been implemented at most Yukon landfills. This has helped to reduce control kills of garbage-dependent bears. The reason for the sustained number of control kills is not well understood by wildlife biologists at this time, but likely due to a range of factors.

Why is it significant?

About 30 percent of the Canada's grizzly bears live in the Yukon.

- Grizzly bears, because they are sensitive to disturbance and range over large tracts of land, are a good indicator of habitat health.
- Because grizzly bears have become extinct in approximately half of the historical ranges in North America, management of the Yukon's grizzly bear population is of national and international significance.
- Globally, grizzly bear habitat has been reduced by approximately 50 percent.

What is being done about it?

- A number of community landfills are now fenced and better garbage control is applied in wilderness camps.
- Grizzly bear habitat is being protected through the establishment of protected areas such as the Ni'iinlii'njik (Fishing Branch) Park.
- The Yukon Department of Environment is educating people who use the outdoors, about approaches to minimize grizzly-human interaction.
- Kluane National Park Reserve is monitoring grizzly bear movement and reproduction. Special grizzly bear management zones have been set up within the park and warnings are provided or trails are closed when grizzly bear-human interaction is too high a risk.
- The Department of Environment, Government of Yukon monitors resident and non-resident grizzly bear harvest, Yukon-wide.

Grizzly bears, because they are sensitive to disturbance and range over large tracts of land, are a good indicator of habitat health.

5.3.6 *Thinhorn Sheep*

What is happening?

- The estimated thinhorn sheep population is 22,000 with densities ranging from less than 2 sheep/100 km2 to more than 30 sheep/100 km^2.
- Of the population, about 19,000 are white Dall Sheep found throughout most of the Yukon and 3,000 are dark Stone or Fannin Sheep found mostly in south-central Yukon.

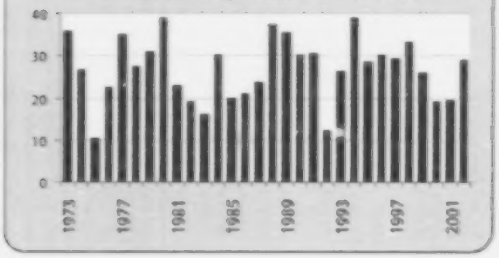
Globally, grizzly bear habitat has been reduced by approximately 50 percent.

Figure 5.3.6.1 Licensed Sheep Harvest

- As shown in Figure 5.3.6.1, an average of 263 sheep are harvested each year by licensed hunters. A cyclical-high and low-harvest pattern seems to be evident in the data.
- Sheep are believed to be at, or near, historical population levels and have re-colonized some ranges where they had previously disappeared (probably due to over-hunting). The population is considered stable, with short term fluctuations.
- Figure 5.3.6.2 shows the variation in the number of lambs per 100 nursery sheep, which includes ewes, yearlings, and some 2-year-old rams. In general 25 lambs per 100 nursery sheep represents a stable population. Biologists have determined that the variation may reflect weather patterns and environmental conditions. Annual growth of Dall Sheep horns also seem to correlate with weather patterns.

There is growing evidence that sheep population trends occur roughly in 10-year cycles and may be related to Pacific climate cycles known as the Pacific Decadal Oscillation.

Figure 5.3.6.2 The Number of Lambs per 100 Nursery Sheep Yukon-wide



Why is it happening?

- The sheep harvest follows the natural trends in population. The cyclical period in Figure 5.3.6.1 appears similar to that in 5.3.6.2.
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- Population numbers are estimated with best available numbers from aerial surveys, and analysis of the number of lambs per 100 nursery sheep.

What is being done about it?

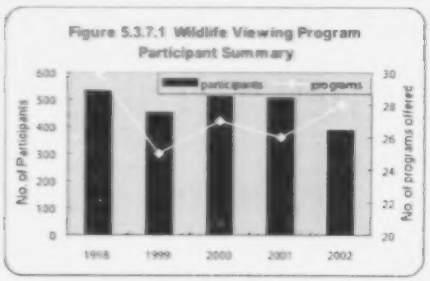
- Population and classification surveys are carried out on an irregular basis and attempts are being made to more formally incorporate ground observations made by interested hunters and residents.
- The sheep harvest is closely monitored.

5.3.7 *Wildlife Values*

What is happening?

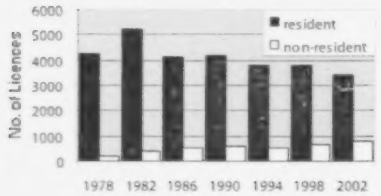
- Yukon people and non-residents value Yukon wildlife and wilderness for a variety of reasons including wildlife viewing, wilderness hiking, hunting, trapping and wilderness education. (See also 4.7 Tourism)
- Figure 5.3.7.1 shows that the participant rate in the Wildlife Viewing Program has decreased slightly since its start in 1998. Twenty-five to 30 programs are offered annually by different organizations.

Figure 5.3.7.1 Wildlife Viewing Program Participant Summary



- The number of visits to the Dempster Interpretive Centre, at Tombstone Park, has increased by a factor of 5 since 1986. The number of visits to Swan Haven Interpretive Centre increased rapidly in its first three years and then levelled off. Since 2000, the number of visitors has increased steadily.
- Thirty-nine percent of Yukon visitors and 28 percent of Yukon people participate in wildlife viewing activities while 11 percent of Yukon people participate in hunting activities.
- The number of resident hunting licences sold has been steadily decreasing since 1982. However, Figure 5.3.7.2 also shows that non-resident hunting licences has been increasing.
- There is a general downward trend of hunting licence sales throughout North America and the average age of hunters is increasing.

Figure 5.3.7.2 Yukon Hunting Licences Sold



Community View

- The majority of people asked in eight areas noted unusual sightings of wildlife near their communities, such as cougar near Carcross, lynx and wolves near Tagish and cougar, bears, sheep and deer near Mayo.
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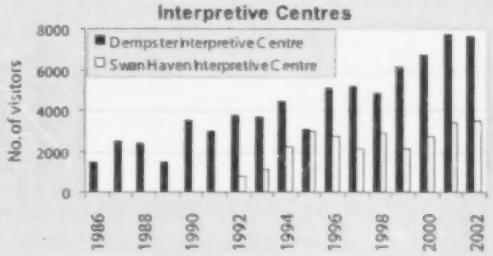
Why is it happening?

- The Government of Yukon's Wildlife Viewing Program was initiated in response to a growing demand for wildlife viewing information and activities from tourists and Yukon residents.
- The decrease in hunting activity may reflect the worldwide trend of an increased interest in wild places and non-consumptive wilderness activities.
- In addition, greater barriers to new hunters such as firearm regulations and increased urbanization may be contributing to the trend. The trend seems to apply to First Nation people as well.
- Given the small number of hunters in the Yukon, statistics can be easily skewed. For example, the population drop in Faro could have affected the number of licences sold.
- The increase in non-resident hunters likely points to Yukon's good reputation for hunting and wilderness.
- Tourists make up the majority of visitors to the Dempster Interpretive Centre.

Figure 5.3.7.3 Visits to Yukon Wildlife Interpretive Centres



Their interests include a range of non-consumptive uses such as wildlife viewing, travel, and general information about Tombstone Park and Yukon's wild areas. Tombstone Park is the first road-accessible territorial park to be established.

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Why is it significant?

- Worldwide, there is an increasing demand for protection of wild spaces as well as a demand for access to view wildlife in their natural habitat. This change in the interests of wilderness users will impact traditional strategies for wildlife and wilderness management.
- Hunting and consumption of wild meat remains a strong part of Yukon culture, particularly First Nations culture.

What is being done about it?

- The Government of Yukon has produced a number of wilderness viewing products including information about methods of minimizing impacts on wildlife and their habitat. The Yukon's Wildlife Viewing Guide Along Major Highways and Explore the Wild, a monthly calendar of events for special programs about wildlife and natural history are particularly popular.
- Management of Yukon's big game harvest is ongoing. (see also 5.3.3 to 5.3.6.)

5.4 SPECIES AT RISK

What is happening?

- Many of the earth's wild species are at risk, including some that live in the Yukon.
- In October 1996, federal, provincial and territorial Wildlife Ministers agreed-in-principle to the National Accord for the Protection of Species at Risk (NAPSR) and committed to a national approach to protect these species. The accord outlines commit-

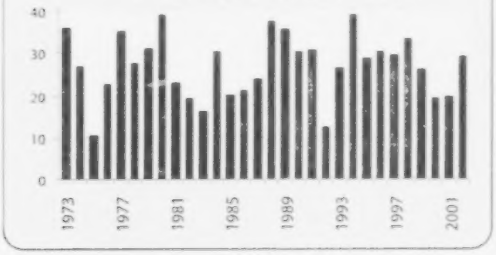
The number of resident hunting licences sold has been steadily decreasing and non-resident hunting licences increasing since 1982.

The number of visits to Dempster Interpretive Centre has increased by a factor of 5 since 1986.

Thirty-nine percent of Yukon visitors and 28 percent of Yukon people participate in wildlife viewing activities.

- As shown in Figure 5.3.6.1, an average of 263 sheep are harvested each year by licensed hunters. A cyclical-high and low-harvest pattern seems to be evident in the data.
- Sheep are believed to be at, or near, historical population levels and have re-colonized some ranges where they had previously disappeared (probably due to over-hunting). The population is considered stable, with short term fluctuations.
- Figure 5.3.6.2 shows the variation in the number of lambs per 100 nursery sheep, which includes ewes, yearlings, and some 2-year-old rams. In general 25 lambs per 100 nursery sheep represents a stable population. Biologists have determined that the variation may reflect weather patterns and environmental conditions. Annual growth of Dall Sheep horns also seem to correlate with weather patterns.

Figure 5.3.6.2 The Number of Lambs per 100 Nursery Sheep Yukon-wide



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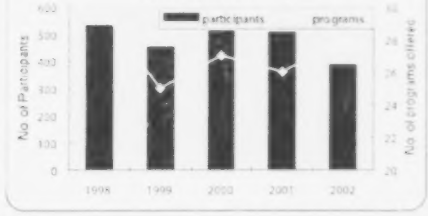

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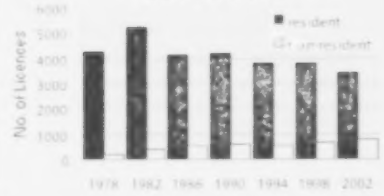

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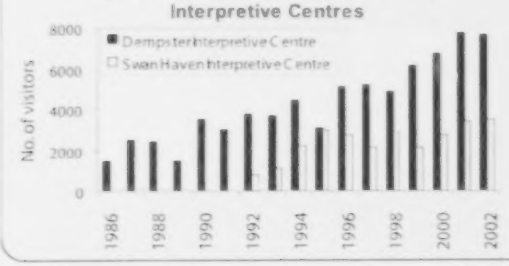

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ments to designate species, protect their habitats and develop recovery plans. Yukon species at risk are identified and managed through various mechanisms, four of which are outlined below:

1. The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) is a national committee that evaluates the status of Canada's wildlife species and identifies those most at risk under seven categories. In the Yukon, 13 species at risk are identified under three categories of risk as shown in Table 5.4.1.

Table 5.4.1 Yukon Species at Risk Under COSEWIC

Endangered	bowhead whale, eskimo curlew
Threatened	wood bison, Peregrine Falcon – anatum subspecies
Special Concern	grizzly bear, polar bear, wolverine, short-eared owl, Peregrine Falcon – tundra subspecies, squanga whitefish, ivory gull, western toad, woodland caribou – northern mountain population

2. The Convention on International Trade in Endangered Species (CITES) governs the cross-border movement of animal parts from species of international concern. The Wild Animal and Plant Protection and Regulation of International and Interprovincial Trade Act (WAPPRIITA) is the legislative vehicle by which Canada meets its obligations under CITES. In general, each province and territory is responsible for the sustainable management of their wild species and their products. (http://www.cites.ec.gc.ca/eng/sct4/index_e.cfm)
3. As a requirement under the NAPSR, Yukon completed its first wildlife status report in 2000. This report provided some Yukon-generated baseline information for future years. A status report will now be completed every five years. As shown in Table 5.4.2, 142 of the 384 species examined were designated to be at risk, possibly at risk or requiring special management.
4. Yukon's Wildlife Act lists the following eight species as "specially protected": elk, muskox, mule deer, cougar, Gyrfalcon, Peregrine Falcon, Trumpeter Swan and the Chisana caribou herd.

Table 5.4.2 Summary of the Status of Yukon's Wildlife Report 2000

Designation	Mammals	Amphibians	Birds	Fish	Total
At Risk	4		34		38
May be at Risk	4	2	52		58
Not at risk but special management may be required	9	1	49	9	76
Not at Risk	48	1	108	11	168
Insufficient Data	3		68	14	85
Total	68	4	291	33	384

- In the mid-1970s, the Peregrine Falcon was locally extinct in most of North America. Through a captive breeding program, the falcons were re-introduced to their former range in the Yukon. In 1999, the Peregrine Falcon was downlisted by COSEWIC from endangered to threatened. The Anatum subspecies summers in the continental interior and remains on the threatened list. The Tundra subspecies summers north of the treeline and has been downlisted to special concern.

Figure 5.4.1 Anatum Peregrine Pairs in the Yukon, 1972-2002

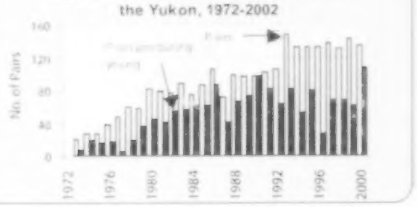
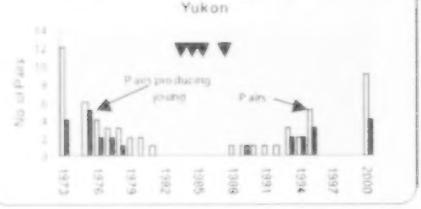


Figure 5.4.2 Tundra Peregrine Pairs in the Yukon



- As shown in Figures 5.4.1 and 5.4.2 both subspecies of the Peregrine Falcon pair numbers as well as pairs with young are increasing in the Yukon.
- Two continental populations of Trumpeter Swans breed in the Yukon. Based on a 2000 survey, the Rocky Mountain population has continued to show an increase. The Yukon portion of the Pacific Coast population showed a slight decrease from 1995 numbers, but this is probably a result of bad weather during the 2000 survey. Most likely, this population is also increasing. No obvious change in migration counts have been recorded since 1995.

Why is it happening?

- Different mechanisms for the protection of species of risk are needed at the territorial, national and global levels to be effective. For example, species numbers may be locally healthy but nationally or globally at risk.
- The decline in Peregrine Falcons has been linked to the use of the pesticide, DDT, which has been banned from use in Canada and the United States. A national recovery plan has aided the re-establishment of Peregrine Falcon populations.

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The pair numbers as well as pairs with young of the two Peregrine Falcon subspecies that summer in the Yukon are increasing.

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Insufficient Data	3		68	14	85
Total	66	4	281	33	384

The federal government assented to Canada's Species at Risk Act (SARA) on December 12, 2002.

4. Yukon's Wildlife Act lists the following eight species as "specially protected": elk, muskox, mule deer, cougar, Gyrfalcon, Peregrine Falcon, Trumpeter Swan and the Chisana caribou herd.

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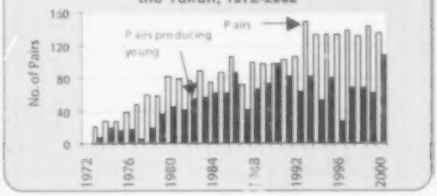

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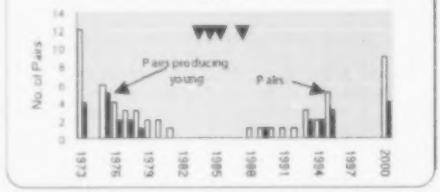


- As shown in Figures 5.4.1 and 5.4.2 both subspecies of the Peregrine Falcon pair numbers as well as pairs with young are increasing in the Yukon.
- Two continental populations of Trumpeter Swans breed in the Yukon. Based on a 2000 survey, the Rocky Mountain population has continued to show an increase. The Yukon portion of the Pacific Coast population showed a slight decrease from 1995 numbers, but this is probably a result of bad weather during the 2000 survey. Most likely, this population is also increasing. No obvious change in migration counts have been recorded since 1995.

Why is it happening?

- Different mechanisms for the protection of species of risk are needed at the territorial, national and global levels to be effective. For example, species numbers may be locally healthy but nationally or globally at risk.
- The decline in Peregrine Falcons has been linked to the use of the pesticide, DDT, which has been banned from use in Canada and the United States. A national recovery plan has aided the re-establishment of Peregrine Falcon populations.

- Trumpeter Swans were over-hunted for food and plumage in the early 1900s. They have been making a slow recovery over the last 100 years and expanding their breeding range in the north. Both populations (Pacific Coast and Rocky Mountain) in northwestern Canada and Alaska are presently increasing at a healthy rate.

Why is it significant?

- The Tundra Peregrine Falcon is recovering from a period in 1982-87 when no breeding birds were found in the area. In the 1970s, Peregrine Falcons were judged to be in danger of extinction.
- Trumpeter Swans were de-listed from the "at risk" list in 1996.

What is being done about it?

- As a commitment under the National Accord for the Protection of Species at Risk, the federal government, passed Canada's Species at Risk Act (SARA) on December 12, 2002. The Act will likely be proclaimed and come into effect by June 2003.
- A population survey of the Tundra Peregrine Falcon was completed in 2000.
- Currently, Trumpeter Swans are surveyed continent-wide (including their known range in the Yukon) every five years. In addition, each year swans are counted daily at Swan Haven Interpretive Centre on Marsh Lake, during spring migration in April and early May. Satellite telemetry is currently being used to track the migration and wintering patterns of Yukon Trumpeter Swans.

Chapter 6 Ecosystems

6.1 WETLANDS

Because the Yukon is a mountainous region, wetlands cover only 3 percent of the land base, a much smaller portion of the land base than many parts of Canada.

WHAT IS HAPPENING?

- Wetlands include bogs, fens, swamps, marshes and shallow open water areas.
- Because the Yukon is a mountainous region, wetlands cover only three percent of the land base, a much smaller portion of the land base than in many jurisdictions in Canada.
- As shown in Figure 6.1.1, the most extensive wetlands occur north of the Arctic Circle in low-lying permafrost terrain but wetlands also exist throughout the Yukon associated with rivers, lakes and on upland plateaus.
- Fifty-four wetlands have been identified as significant, based mainly on their value as migratory bird habitats for moulting, breeding or migratory "rest-stops". Eleven of these wetlands have been added to the list since 1999. Some of these areas provide habitat for species that are rare or of restricted distribution in the Yukon.
- Wetland inventory is ongoing, both as part of broad ecoregion inventories, as well as specific wetland inventories.
- Since 1999, the Ducks Unlimited Boreal Forest Initiative has surveyed wetlands in the southern lakes region for waterfowl and undertaken wetlands mapping on the Peel Plateau in Northeast Yukon.
- Between 1973 and 1999, there has been a decline in about 6.8 percent of water surface area in Old Crow Flats, a large system of lakes and wetlands in the North Yukon.
- (Note: it is difficult to compare the Figure 6.1.1 map to the 1999 SOE map due to some changes in grouping of wetland areas.)

Focused inventory work is being carried out because wetlands are highly valuable and productive but relatively scarce habitats.

Why is it happening?

- In many parts of Canada, there has been a substantial loss of wetlands as a result of drainage for urban expansion, agriculture and flooding by hydroelectric development. Comparatively, there have been fewer negative impacts on Yukon's wetlands.
- Focused inventory work is being carried out because wetlands are highly valuable and productive but relatively scarce habitats.
- Wetlands are subject to natural fluctuations in water levels responding to seasonal changes in precipitation and temperature. There is a summer warming trend in the Old Crow Flats area, which may be increasing rates of evaporation.

Why is it significant?

- Wetlands are storehouses and purifiers of water, provide flood control, and provide critical habitat (shelter, food and water) for song birds, waterfowl, raptors, moose, small mammals and other species. Wetlands may contain large quantities of peat.
- Old Crow Flats provides habitat for peregrine falcons, songbirds, aquatic and terrestrial mammals, and breeding and moulting grounds for a variety of waterfowl species. A changing climate could have negative impacts on this wildlife and habitats. (see also 2.3 Impacts of Climate Change).

What is being done about it?

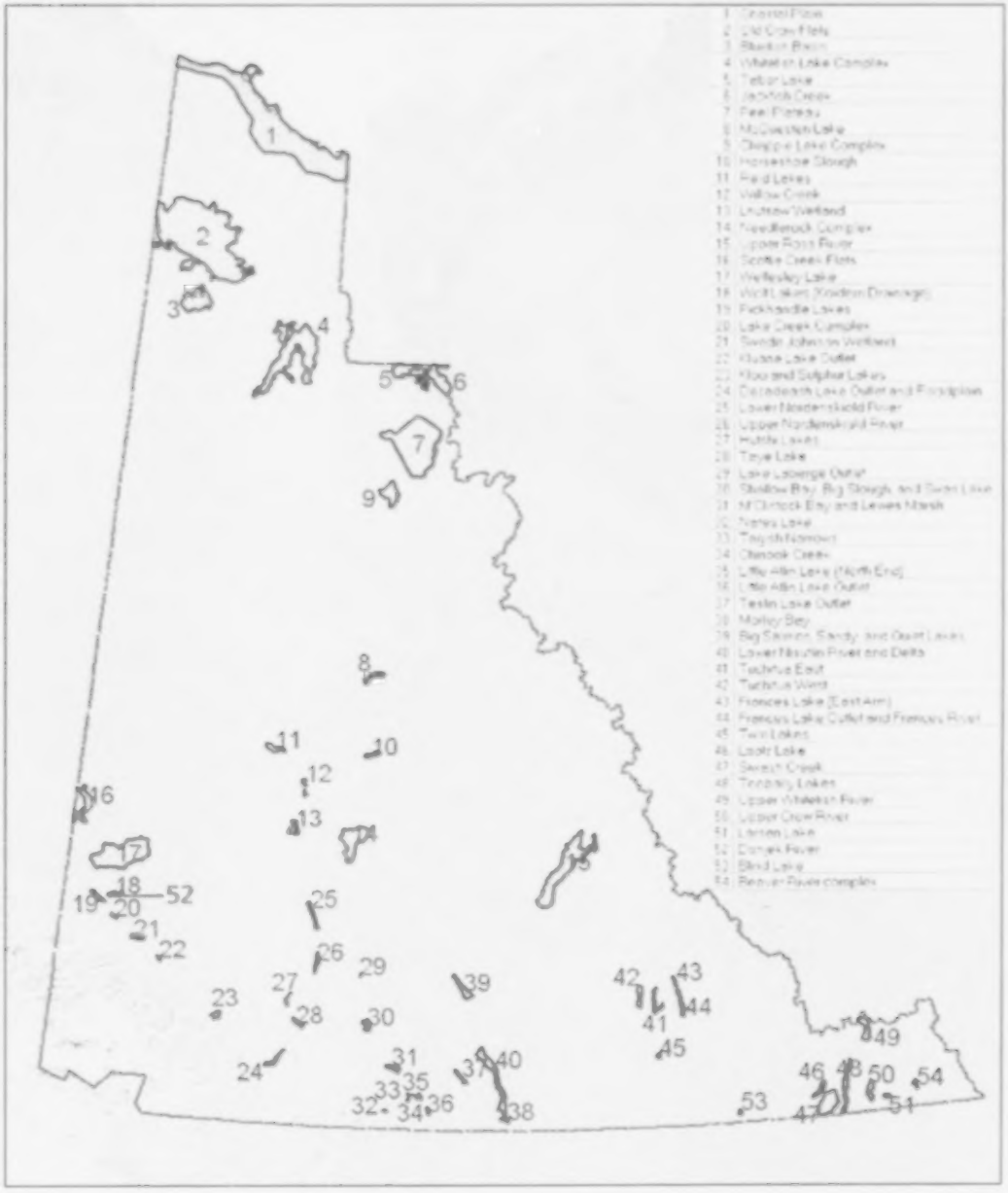
- Wetland inventory work is being carried out by the Yukon Wetlands Technical Committee, Nature Serve Yukon and Ducks Unlimited.
- Strategies to conserve Yukon's wetlands are being spearheaded by Ducks Unlimited.

6.2 FORESTS
(See also 4.5 Land Use-Forestry)

WHAT IS HAPPENING?

- Yukon's forest ecology reflects three key environmental conditions: cool soil temperatures; low annual precipitation; and a short growing season.
- All of Yukon's forests are considered boreal but vary regionally reflecting differences in climate, geology, landform and vegetation.
- Natural disturbance agents such as wildfire, insects and diseases, blow-down and flooding play a critical role in forest ecosystem dynamics.
- The amount of natural fire activity within an area or ecosystem is generally a function of the amount of forest cover, lightning activity and climate.
- As a fire management tool, the territory is divided into two zones: the fire action zone for areas that need to be protected; and the fire observation zone for areas of lesser value. Fires starting in action zones are fought aggressively. In observation zones, fires are only fought if they pose a threat to public safety or infrastructure. The fire action zone area has increased during this SOE reporting period (1999-2002).

Figure 6.1.1 Map of Important Wetlands in the Yukon



In many parts of Canada, there has been a substantial loss of wetlands as a result of drainage for urban expansion, agriculture and flooding by hydroelectric development. Comparatively, there have been fewer negative impacts on Yukon's wetlands.

Figure 6.2.1 Yukon Forest Fire Statistics (1946 to 2002)

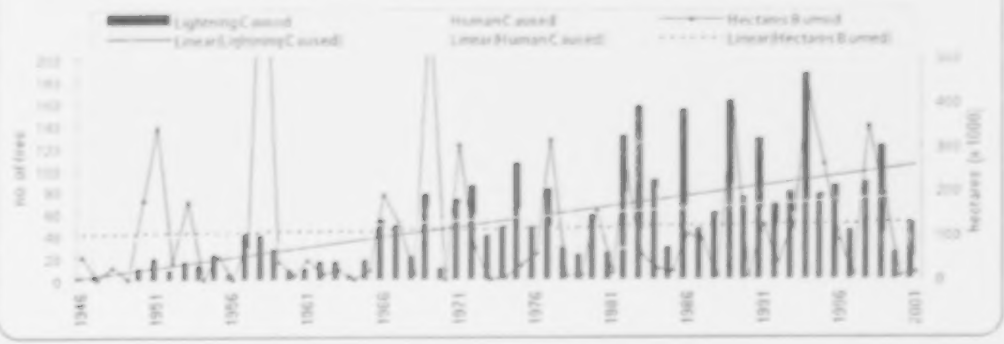


Figure 6.2.1 shows Yukon's forest fire statistics for the past 55 years. The number of natural and human-caused fires, and hectares burned per year, has been increasing since the 1950s but to an even greater degree in the 1990s. The number of lightning-caused fires has been increasing faster than human-caused fires. The area burned has been increasing at a slower rate than the number of fires.

- The forests affected by the spruce bark beetle in southwest Yukon increased from 22,600 hectares in 2001 to 69,415 hectares in 2002. The rate of infestation increased by more than 300 percent and the cumulative area of infestation now exceeds 250,000 hectares. (see also 2.3 Impacts of Climate Change)
- A significant increase in spruce budworm activity was detected in the La Biche and Watson Lake areas of southeast Yukon.

Community View

- Most of those asked reported that standing spruce with red needles have increased in number in five communities (Carcross/Tagish, Whitehorse/Laberge, Burwash/Destruction Bay, Carmacks and Watson Lake).
- In Whitehorse/Laberge, Carcross/Tagish, Pelly Crossing, Old Crow, Watson Lake and Dawson, most people reported an increase in soil erosion at shorelines.
- Leaves came out early in four areas, according to most of those interviewed in Pelly Crossing, Carmacks, Burwash/Destruction Bay and Carcross/Tagish. The majority of those interviewed in Mayo reported late leaf out while most of those asked in Teslin and Watson Lake said there has been no change (1995-2000).

- Trace levels of spruce budworm activity were detected for the first time over a wide area: the Alsek and Kaskawulsh river valleys to Congdon Creek in 2002.
- There are eight tree species in Yukon's boreal forest. The Sub-alpine Fir (Abies lasiocarpa) was elected as Yukon's official tree in 2001, by public vote. The Sub-alpine Fir grows 6 to 20 metres tall and is found in the Yukon regions south of the Dawson area (64 degrees north latitude) and east of Haines Junction (138 degrees longitude). It generally grows at higher elevations.

Why is it happening?

- Overall, Yukon communities have been experiencing a trend of warmer winters and summers over most of the past century. An exception is Watson Lake, which has experienced no significant change in winter and summer temperatures. Changes in precipitation trends are more variable. In general, summer precipitation shows a moderate to pronounced increase in most communities. Winter precipitation varies between a pronounced increase to a pronounced decrease among communities. Watson Lake winter precipitation shows a pronounced decrease. Changing climatic conditions could be creating an environment for increased fire starts in some Yukon regions. (See also 2.2 Primary Indicators of Climate Change)
- Methods for collecting fire statistics may also have changed over the years, which could distort long term trends.
- The Fire Action Zone has enlarged because of changing human values. Previously, it contained townsites, and areas with private and public infrastructure but it has expanded to include areas with high timber harvesting values, cultural heritage and important ungulate populations, for example. Because there are more fire action zones and increased effort is going into fighting fires, the area burned may not be increasing at the same rate as the number of fires.
- Insects may be expanding their range to the north, in part, as a result of warming conditions and lower

The rate of spruce beetle infestation increased by more than 300 percent in southwest Yukon from 2001 to 2002.

Figure 6.2.1 Yukon Forest Fire Statistics (1946 to 2002)

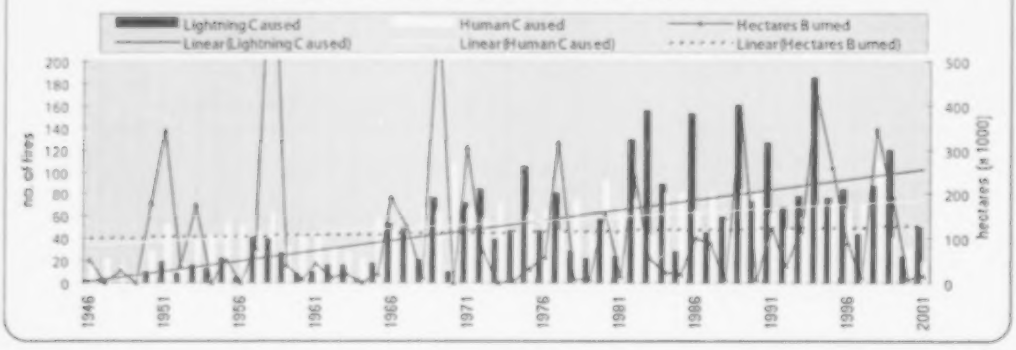


Figure 6.2.1 shows Yukon's forest fire statistics for the past 55 years. The number of natural and human-caused fires, and hectares burned per year, has been increasing since the 1950s but to an even greater degree in the 1990s. The number of lightning-caused fires has been increasing faster than human-caused fires. The area burned has been increasing at a slower rate than the number of fires.

The number of natural and human-caused fires and hectares burned per year has been increasing since the 1950s.

- The forests affected by the spruce bark beetle in southwest Yukon increased from 22,600 hectares in 2001 to 69,415 hectares in 2002. The rate of infestation increased by more than 300 percent and the cumulative area of infestation now exceeds 250,000 hectares. (see also 2.3 Impacts of Climate Change)
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Insects may be expanding their range to the north as a result of warming conditions and drier conditions.

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- There are eight tree species in Yukon's boreal forest. The Sub-alpine Fir (Abies lasiocarpa) was elected as Yukon's official tree in 2001, by public vote. The Sub-alpine Fir grows 6 to 20 metres tall and is found in the Yukon regions south of the Dawson area (64 degrees north latitude) and east of Haines Junction (138 degrees longitude). It generally grows at higher elevations.

Why is it happening?

- Overall, Yukon communities have been experiencing a trend of warmer winters and summers over most of the past century. An exception is Watson Lake, which has experienced no significant change in winter and summer temperatures. Changes in precipitation trends are more variable. In general, summer precipitation shows a moderate to pronounced increase in most communities. Winter precipitation varies between a pronounced increase to a pronounced decrease among communities. Watson Lake winter precipitation shows a pronounced decrease. Changing climatic conditions could be creating an environment for increased fire starts in some Yukon regions. (See also 2.2 Primary Indicators of Climate Change)
- Methods for collecting fire statistics may also have changed over the years, which could distort long term trends.
- The Fire Action Zone has enlarged because of changing human values. Previously, it contained townsites, and areas with private and public infrastructure but it has expanded to include areas with high timber harvesting values, cultural heritage and important ungulate populations, for example. Because there are more fire action zones and increased effort is going into fighting fires, the area burned may not be increasing at the same rate as the number of fires.
- Insects may be expanding their range to the north, in part, as a result of warming conditions and lower

than average levels of winter precipitation in some areas. The infested areas are generally older forests and in zones that experienced recent drought conditions. Older trees are more prone to disease or insect infestation and drought further diminishes a tree's resistance.

- The Sub-alpine Fir is a popular Christmas and landscaping tree because of its shape and fragrance. Tea made from the needles is a traditional First Nation's cold remedy rich in Vitamin C. Sap drawn from bark blisters has been used by First Nation people as a traditional medicine for lung ailments.

Why is it significant?

- The significant increase in spruce bark beetle activity follows a recent drought period in the area that has appeared to have subsided. The effects of insect populations that build up during a drought often take years to be noticed. Therefore, it is not known at this point whether insect activity will subside over the next few years or whether the duration and intensity of insect and disease activity may continue to increase beyond historic levels, as a result of longer term climate conditions. The infestation could affect the short-term ecosystem resilience of some Yukon forests.
- Wildfire intensity and activity may also continue to increase. This increase could affect changes in the forest ecology and could result in increased fire management costs.

What is being done about it?

- A number of projects such as the Canadian Forest Service's Forest Health Assessment project are being carried out to better understand the impact on forest ecology as a result of the recent spruce bark beetle infestations.
- Community fire protection has become an important issue, resulting in the well-used Fire Smart Program. The Fire Smart Program also provides jobs in communities.
- As part of the Devolution Transfer Agreement, forest and forest fire management will be transferred to the Government of Yukon from the federal government on April 1, 2003.

Glossary

Agroclimate Classification
Compilation of the average and extreme weather of an area as it affects agricultural cropping in that area. Agroclimatic classification is based on limitations of an area's available heat and/or moisture.

Ambient Air Pollution
The degradation of the quality of non-conditioned outside air resulting from unwanted chemicals or other materials occurring in the air.

Annual Allowable Harvest
The allowable harvest established annually by wildlife managers based on management experience, case history analysis and relevant guidelines and criteria.

Calf Recruitment
The number of calves per 100 cows measured in the fall.

Canada-Wide Standards
National scientific standards that include the establishment of acceptable levels in ambient air for $PM_{2.5}$ and O_3.

Carbon Dioxide Equivalent
A metric measure used to compare the emissions from various greenhouse gases based upon their global warming potential (GWP). The carbon dioxide equivalent for a gas is derived by multiplying the tons of the gas by the associated GWP. For example, the GWP for methane is 24.5.

Carbon Monoxide (CO)
An air pollutant that is a colorless, odourless, poisonous gas produced by incomplete combustion; particularly, incomplete burning of carbon-based fuels such as gasoline, oil and wood.

Carbon Tetrachloride
A compound consisting of one carbon atom and four chlorine atoms. Carbon tetrachloride was widely used as a raw material in many industrial uses, including the production of CFCs, and as a solvent.

Chlorofluorocarbons (CFCs)
A compound consisting of chlorine, fluorine, and carbon. CFCs are very stable in the troposphere. They are broken down by strong ultraviolet light in the stratosphere and release chlorine atoms that deplete the ozone layer. CFCs are commonly used as refrigerants, solvents, and foam blowing agents.

CITES
(Convention on International Trade in Endangered Species of Wild Fauna and Flora) An international agreement between governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival.

Coliform
A group of bacteria that, if present in water, show that other pathogens may exist. Coliform bacteria are indicator organisms and may not be harmful themselves.

Contaminated Site
"A site at which substances occur at concentrations: above background levels and pose, or are likely to pose, an immediate or long-term hazard to human health and the environment; or exceed levels specified in policies and regulations;" (INAC Contaminated Sites Management Policy) or "an area of land in which the soil, including any groundwater lying beneath it , or the water including the sediment and bed below it, contains a contaminant which is an amount, concentration or level in excess of that prescribed by regulation or allowed under a permit." (Section 111, Yukon *Environment Act*)

COSEWIC (Committee on the Status of Endangered Wildlife in Canada)
A committee of experts that assesses and designates which wild species are in some danger of disappearing from Canada.

Cryptosporidium
Cryptosporidium enteritis is an infection of the small intestine characterized by diarrhea, which is caused by the parasite cryptosporidium.

Data Deficient
A species for which there is insufficient scientific information to support status designation. (COSEWIC Designation)

Design Flood
The hypothetical flood used in the sizing of dams and other structures to prevent failure by overtopping, especially for the spillway and outlet works.

Ecosystem Resilience (Forest)
A measure of a forest's ability to recover from major disturbance such as fire or insect infestations, a key element of forest health.

El Niño
Spanish for the "Christ Child". Fishermen in Peru and Ecuador used to use this term to refer to the normal warming of coastal waters around Christmas. It has come to be used as a term for abnormal warming events which occur, on an average of two or three times a decade and typically last for a few seasons.

Endangered
A species facing imminent extirpation or extinction. (COSEWIC Designation)

Escapement (Spawning)
The number of salmon returning to their spawning grounds.

Extinct
A species that no longer exists. (COSEWIC Designation)

Extirpated
A species that no longer exists in the wild in Canada, but occurring elsewhere. (COSEWIC Designation)

Extirpation
The extinction of a species or other group of organisms in a particular local area.

Frost-Free Period
The number of days between the average last date of 0° C in the spring and the average first date of 0° C in the fall. For the purposes of agroclimatic calculation the growing season is considered finished at the first killing frost (-2.5°C) after July 15.

Fuel Wood
Any personal or commercial wood, usually cut as a source of "fuel" for space heating, and removed from the forest in lengths less than 2.5 metres.

Giardiasis
A disease that results from an infection by the protozoan parasite *Giardia lamblia*, caused by drinking water that is not properly treated. The disorder is more prevalent in children than in adults and is characterized by abdominal discomfort, nausea, and alternating constipation and diarrhea.

Greenhouse Effect
The effect produced as greenhouse gases allow incoming solar radiation to pass through the Earth's atmosphere, but prevent most of the outgoing infrared radiation from the surface and lower atmosphere from escaping into outer space. This process occurs naturally and has kept the Earth's temperature warmer than it would otherwise be. Current life on Earth could not be sustained without the natural greenhouse effect.

Ground Level Ozone (O_3)
A molecule that consists of three oxygen atoms bonded together. Ozone that is present in the earth's troposphere is mostly a result of human-caused pollution.

Growing Degree Day
A form of degree day used as a guide to determine the most appropriate time to plant and harvest crops: A day on which the mean daily temperature is one degree above the base temperature-minimum required for growth of a particular crop. For agroclimatic calculations growing degree days base temperature is 5 °C (40°F).

Habitat/Species Management Area
ICUN Protected Area Category IV. A protected area managed mainly for conservation through management intervention.

Halon
A compound consisting of bromine, fluorine, and carbon. Halons are used in fire protection because they are: effective fire extinguishing agents; non-corrosive; electrically non-conductive; and leave no solid or liquid residue.

Hazardous Waste
Any waste material that is potentially dangerous, including but not limited to material that is explosive, radioactive, ignitable, corrosive, toxic, or reactive.

Hydrochlorofluoro-Carbons (HCFCs)
A compound consisting of hydrogen, chlorine, fluorine, and carbon. The HCFCs are one class of chemicals being used to replace the CFCs. They contain chlorine and thus deplete stratospheric ozone, but to a much lesser extent than CFCs. They are used in refrigerants, solvents and both rigid and flexible foams.

Hydrologic Zone
A geographical area representing all of a surface drainage basin.

Ichthyophonus
A fungal parasite present in a number of fish species.

International Panel On Climate Change (IPCC)
The IPCC was established jointly by the United Nations Environment Programme and the World Meteorological Organization in 1988. The purpose of the IPCC is to assess information in the scientific and technical literature related to all significant components of the issue of climate change. The IPCC draws upon hundreds of the world's expert scientist as authors and thousands as expert reviewers. Leading experts on climate change and environmental, social, and economic sciences from some 60 nations have helped the IPCC to prepare periodic assessments of the scientific underpinnings for understanding global climate change and its consequences.

International World Conservation Union (IUCN)
An international organization established to encourage societies throughout the world to conserve the integrity and diversity of nature, in part, through the creation of protected areas. It has developed standardized categories to enable protected area accounting around the globe.

Leachate
Liquids that have percolated through a soil and that carry substances in solution or suspension.

Managed Resource Protected Area
ICUN Protected Area Category VI. A protected area managed mainly for the sustainable use of natural ecosystems.

Methyl Bromide
Methyl bromide was used as a fumigant in pesticides.

Methyl Chloroform
A compound consisting of carbon, hydrogen, and chlorine. Methyl chloroform is used as an industrial solvent.

Micrometer (um)
A unit of measure (one millionth of a metre).

National Accord for the Protection of Species at Risk
An Agreement among federal, provincial and territorial governments to work on a common approach to protecting species at risk in Canada that includes complementary legislation and programs to protect habitat and species. Yukon signed on in 1998.

National Ambient Air Quality Objectives (NAAQOs)
National scientific objectives that set out benchmark levels of protection for people and the environment in Canada, including maximum desirable and acceptable levels of CO and NO_x. cides.

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A compound consisting of carbon, hydrogen, and chlorine. Methyl chloroform is used as an industrial solvent.

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National scientific objectives that set out benchmark levels of protection for people and the environment in Canada, including maximum desirable and acceptable levels of CO and NO_x.

National Park
ICUN Protected Area Category II. A protected area managed mainly for ecosystem protection and recreation.

Natural Monument
ICUN Protected Area Category III. A protected area managed mainly for conservation of specific natural features.

NDVI: (Normalized Difference Vegetation Index)
NDVI measurements may be used as an index of the amount of green plant biomass present at a given time. NDVI values are determined from weather satellites that cover the globe on a daily basis. Sensors on board the satellites are related to the amount of vegetation on the ground.

Nephelometric Turbidity Unit (NTU)
A unit of measure for the turbidity of water; essentially, a measure of the cloudiness of water as measured by a nephelometer. Turbidity is based on the amount of light that is reflected off particles in the water.

Nitrogen Oxides (NO_x)
Nitrogen-based compounds released during the combustion of fossil fuels.

Not At Risk
A species that has been evaluated and found to be not at risk. (COSEWIC Designation)

Nursery Sheep
Sheep that includes ewes, yearlings, and the few 2-year-old rams that have not yet joined ram bands. These animals cannot always be reliably distinguished during aerial surveys and so are grouped together.

Ozone Depletion
Chemical destruction of the stratospheric ozone layer beyond natural reactions. Stratospheric ozone is constantly being created and destroyed through natural cycles.

Pacific Decadal Oscillation (PDO)
A weather pattern often described as a long-lived El Niño-like pattern of Pacific climate variability. Extremes in the PDO pattern are marked by widespread variations in Pacific Basin and North American climate. The extreme phases of the PDO have been classified as being either warm or cool, as defined by ocean temperature anomalies in the northeast and tropical Pacific Ocean.

Particulate Matter (PM)
Airborne particulate matter, known as PM, is one of the major components of smog. PM include microscopic particles in the air. These particles, capable of being inhaled by humans, are divided into two size ranges $PM_{2.5}$ and $PM_{<10}$. A third category is ultrafines, a subgroup of $PM_{2.5}$, which are particles <0.1ug

Parts Per Million (PPM)
This term give scientists a way to describe how much of a substance is contained in a sample. e.g. parts of CO per million parts of air.

Photochemical Smog
Natural and artificially emitted hydrocarbons in the presence of oxides of nitrogen undergo photochemical reactions which produce a cloud of toxic chemicals including ozone and a variety of caustic agents. This process is powered by sunlight and some of the products, such as ozone, reach a peak when the sun's photon flux is most powerful, around midday.

Polar Stratospheric Clouds (PSCs)
High altitude clouds found in the stratosphere where the temperature is less than -85 degrees Celsius. Commonly found over the Arctic and Antarctica, they have a role in the creation of the ozone hole over Antarctica.

Protected Area
"An area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means." (IUCN definition)

Protected Landscape/Seascape
ICUN Protected Area Category V. A protected area managed mainly for landscape/seascape protection and recreation.

Round Wood
Any section of the stem or thicker branches of a tree that has been cut but not processed beyond removal of the limbs or bark or, in the case of fuel wood, splitting of the section.

Saw Log
The term saw log was removed from the 2001 Timber Regulations. Prior to 2001 the term saw log referred to any logs to be used for mill products. The Forest Management Branch no longer uses a "saw log" definition.

Special Concern
A species with characteristics that make it particularly sensitive to human activities or natural events. (COSEWIC Designation)

Special Management Area
An area identified and established within a Traditional Territory pursuant to Chapter 10 of First Nation Final Agreements.

Specially Protected Wildlife
A designation of protection of a species, population or type of wildlife under the *Wildlife Act*.

Species of Special Concern
Committee on the Status of Endangered Species in Canada (COSEWIC) designation for a species with characteristics that make it particularly sensitive to human activities or natural events.

Spruce Bark Beetle (*Dendroctonus Rufipennis*)
The spruce bark beetle common to spruce forests in North America, is the most destructive pest of mature forest stands in western Canada. Records indicate that spruce bark beetle infestations have occurred in southwest Yukon since the 1940's (NAP 1994). Severe outbreaks are usually associated with blow down, high stumps following logging or poor slash disposal practices. In the Yukon the spruce bark beetle usually has a two-year life cycle. In exposed host material, such as stumps, log decks and stand edges, broods may mature in one year depending on the amount of solar radiation (Humphreys and Safranyik 1993).

Spruce Budworm (*Choristoneura Spp.*)
Native to North America, the spruce budworm is considered one of the most destructive pests of Douglas fir, true firs and spruce forests. Generally, the larvae, preferring the upper crown, feed on new needles only partially eating the buds. Infested spruce and fir stands take on a reddish color in the summer due to the abundance of dead needles. In the fall these needles carried off by wind or rain and the stands are turn a grayish color. Severe defoliation may result in reduced incremental growth, dieback of tree tops, and mortality of regeneration and mature trees (Unger 1995).

Stratosphere
The region of the atmosphere above the troposphere. The stratosphere extends from about 10km to about 50km in altitude. Commercial airlines fly in the lower stratosphere. The stratosphere gets warmer at higher altitudes.

Strict Nature Reserve/Wilderness Area
ICUN Protected Area Category I. A protected area managed mainly for science of wilderness protection.

Threatened
A species that is likely to become endangered if limiting factors are not reversed. (COSEWIC Designation).

Total Allowable Catch
Amount of catch that may be taken from a stock after spawning escapement has been achieved.

Troposphere
The region of the atmosphere closest to the Earth. The troposphere extends from the surface up to about 10 km in altitude, although this height varies with latitude.

Type I Contaminated Site
Sites include: Western Copper, Dublin Gulch, Mount Skookum, La Forma, Sa Dena Hes, and Kudz Ze Kayah.

Type II Contaminated Site
Mine sites which could result in unfunded environmental liabilities for government. Sites include Faro, United Keno Hill, BYG, Mount Nansen, Ketza River, Clinton Creek, Viceroy Brewery Creek and Minto.

Volatile Organic Compounds (VOCs)
Organic compounds that evaporate readily into the air. VOCs include substances such as benzene, toluene, methylene chloride, and methyl chloroform.

Year Class Strength
The number of spawning fish by age class.

Ecoregions of the Yukon

(code numbers are part of a national framework for the classification of ecoregions)

Ecoregion	Ecozone	Code
Mount Logan	Pacific Maritime	184
Yukon Coastal Plain	Southern Arctic	32
Peel River Plateau	Taiga Plain	51
Fort Macpherson Plain		53
Muskwa Plateau		66
British Richardson Mountains	Taiga Cordillera	165
Old Crow Basin		166
Old Crow Flats		167
North Ogilvie Mountains		168
Eagle Plains		169
Mackenzie Mountains		170
Selwyn Mountains		171
Klondike Plateau	Boreal Cordillera	172
Saint Elias Mountains		173
Ruby Ranges		174
Yukon Plateau-Central		175
Yukon Plateau-North		176
Yukon Southern Lakes		177
Pelly Mountains		178
Yukon-Stikine Highlands		179
Boreal Mountains and Plateaus		180
Liard Basin		181
Hyland Highland		182

References

Chapter 1 Air and Atmosphere

1.1 Ambient Air Quality

General:

Environmental Protection and Assessment Branch, Department of Environment, Government of Yukon (http://www.environmentyukon.gov.yk.ca/epa/index.shtml)

National Air Pollution Surveillance Network (NAPS), Environment Canada website (http://www.etcentre.org/home/air_e.html)

Energy Solutions Centre (http://www.nrgsc.yk.ca/)

Specific:

Figure 1.1.1

Source: Environmental Protection and Assessment Branch, Department of Environment, Government of Yukon

1.2 Stratospheric Ozone

General:

Department of Environment, Government of Yukon

Environmental Indicators, Environment Canada (http://www.ecoinfo.org/env_ind/region/ozone/ozone_e.cfm)

Stratospheric Ozone, Environment Canada (http://www.ec.gc.ca/ozone/en/index.cfm)

Ozone Depletion and Climate Change: Understanding the Linkages Report, Environment Canada (http://exp-studies.tor.ec.gc.ca/e/ozone/OzoneDepletionClimateChange.pdf)

Northern Climate ExChange (http://yukon.taiga.net/knowledge/resources/bulletins.html)

Chapter 2 Climate Change

2.1 Drivers of Climate Change

General:

Canada's Greenhouse Gas Inventory 1990-2000, Greenhouse Gas Division, Environment Canada, June 2002 (http://www.ec.gc.ca/pdb/ghg/1990_00_report/foreword_e.cfm)

Energy Policy & Programs, Energy Mines and Resources, Government of Yukon

Northern Climate ExChange (http://www.taiga.net/nce/index.html)

Energy Solutions Centre (http://www.nrgsc.yk.ca/)

Environmental Protection and Assessment Branch, Department of Environment, Government of Yukon (http://www.environmentyukon.gov.yk.ca/epa/climate.shtml)

Yukon Bureau of Statistics, Government of Yukon, 2002. Yukon Energy Facts 2002: Annual Report (http://www.gov.yk.ca/depts/eco/stats/annual/energy_02.pdf)

Specific:

Figures 2.1.1, 2.1.2, 2.1.3

Source: Greenhouse Gas Division, Environment Canada, June 2002. Canada's Greenhouse Gas Inventory 1990-2000 (http://www.ec.gc.ca/pdb/ghg/1990_00_report/foreword_e.cfm)

2.2 Primary Indicators of Climate Change

General:

Meteorological Service of Canada, Environment Canada (http://www.msc-smc.ec.gc.ca/contents_e.html)

Environment Canada's Environmental Indicators-Climate Change website (http://www.ecoinfo.org/env_ind/region/climate/climate_e.cfm)

Northern Climate ExChange (http://www.taiga.net/nce/index.html)

Environmental Protection and Assessment Branch, Department of Environment, Government of Yukon (http://www.environmentyukon.gov.yk.ca/epa/climate.shtml)

Specific:

Table 2.2.1

Source: Data from Environment Canada Weather Records

2.3 Impacts of Climate Change

General:

Water Resources Branch, Department of Environment, Government of Yukon

Pacific and Yukon Region, Canadian Wildlife Service, Environment Canada (http://www.pyr.ec.gc.ca/EN/Wildlife/about/index.shtml)

Canadian Forest Service, Pacific Forestry Centre, Natural Resources Canada

Fish and Wildlife Branch, Department of Environment, Government of Yukon

Heritage Resources Branch, Department of Tourism and Culture, Government of Yukon

Northern Climate ExChange (http://www.taiga.net/nce/index.html)

Arctic Borderlands Research Cooperative Indicator-Early Summer Green Vegetation in Caribou Calving Areas (http://www.taiga.net/coop/indics/ndvi.html)

Carcross-Tagish First Nation, Champagne & Aishihik First Nations, Kluane First Nation, Kwanlin Dun First Nation, Spring 2002. Ice Patch Newsletter

Specific:

Figure 2.3.1

Source: Water Resources Branch, Department of Environment, Government of Yukon

Figure 2.3.2

Source: Pacific and Yukon Region, Canadian Wildlife Service, Environment Canada (data from U.S. Fish and Wildlife Service and Biological Resource Division, U.S.G.S.)

Chapter 3 Water

3.1 Drinking Water Quality

General:

Environmental Health Services, Department of Health and Social Services, Government of Yukon (http://www.hss.gov.yk.ca/prog/eh/index.html)

Health Canada (www.hc-sc.gc.ca)

Specific:

Table 3.1.1

Source: Summarized from Infrastructure Status Report-2002, Community Services, Government of Yukon

3.2 Water Quality, Quantity and Use

General:

Water Resources Branch, Department of Environment, Government of Yukon (http://www.environmentyukon.gov.yk.ca/water/index.shtml)
Community Development Branch, Community Services, Government of Yukon (http://www.gov.yk.ca/depts/community/general/communitydevelopment.html)
Environmental Health Services, Health and Social Services, Government of Yukon (http://www.hss.gov.yk.ca/prog/eh/index.html)
Energy Solutions Centre (http://www.nrgsc.yk.ca/)

Specific:

Figures 3.2.1, 3.2.2, 3.2.3 and 3.2.4
Source: Water Resources Branch, Department of Environment, Government of Yukon
Table 3.2.1
Source: Data summarized from Infrastructure Status Report-2000, Community Services, Government of Yukon

Chapter 4 Land

4.1 Protected Areas

General:

Parks Branch, Department of Environment, Government of Yukon (http://www.environmentyukon.gov.yk.ca/parks/index.shtml)
International World Conservation Union (http://www.iucn.org/themes/wcpa/wcpa/protectedareas.htm)
Land Claims and Implementation Secretariat, Executive Council Office, Government of Yukon (http://www.gov.yk.ca/depts/eco/landclaims/index.html)

Specific:

Figure 4.1.1
Source: Parks Branch, Department of Environment, Government of Yukon

4.2 Waste: Solid, Special, Recyclables & Compost

General:

Raven Recycling Society (http://www.ravenrecycling.homestead.com/files/Raven.html)
Environmental Protection and Assessment Branch, Department of Environment, Government of Yukon (http://www.environmentyukon.gov.yk.ca/epa/index.shtml)
Community Development Branch, Community Services, Government of Yukon (http://www.gov.yk.ca/depts/community/general/communitydevelopment.html)
Engineering and Environmental Services, City of Whitehorse, Yukon

Specific:

Table 4.2.1
Source: Data summarized from Infrastructure Report 2002, Community Services, Government of Yukon and Raven Recycling Society information
Figure 4.2.1
Source: Data from Raven Recycling Society and City of Whitehorse (01/02 Compost: refers to City of Whitehorse collection including 8 months of city-wide curbside compost collection program)

4.3 Contaminated Sites

General:

Waste Management Program, Indian and Northern Affairs Canada (INAC)
Contaminated Sites Regulation Information, Department of Environment, Government of Yukon (http://www.environmentyukon.gov.yk.ca/epa/coninfop.shtml)
Northern Contaminated Sites Program, Indian and Northern Affairs Canada (http://www.ainc-inac.gc.ca/ps/nap/consit/index_e.html)

Specific:

1 Definition in INAC Contaminated Sites Management Policy (http://www.ainc-inac.gc.ca/ps/nap/consit/manpol_e.html)
2 Definition in Section 111,Yukon *Environment Act*, Department of Environment, Government of Yukon (http://www.environmentyukon.gov.yk.ca/main/content/envact.pdf)
Figure 4.3.1
Source: Waste Management Program, Indian and Northern Affairs Canada

4.4 Land Use - Mining

General:

Mineral Resources Branch, Energy, Mines and Resources, Government of Yukon (http://www.emr.gov.yk.ca/Mining/default.htm)
Yukon Bureau of Statistics, Executive Council Office, Government of Yukon (http://www.gov.yk.ca/depts/eco/stats/index.html)

Specific:

Figure 4.4.1 and Table 4.4.1
Source: Mineral Resources, Energy Mines and Resources, Government of Yukon
1 Yukon Mineral Property Update, 2002, Mineral Resources Branch, Energy, Mines and Resources, Government of Yukon
2 Department of Fisheries and Oceans December 16, 2002 news release (http://www-comm.pac.dfo-mpo.gc.ca/pages/release/p-releas/2002/nr079_e.htm
3 Various Klondike Placer Miners' Association News Releases (http://www.kpma.ca/home.htm)

4.5 Land Use - Forestry

General:

Forest Management Branch, Energy, Mines & Resources, Government of Yukon (http://www.emr.gov.yk.ca/Forestry/default.htm)
Canadian Forest Service, Pacific Forestry Centre, Natural Resources Canada
Corporate Policy & Planning, Energy, Mines & Resources, Government of Yukon
Forest Fire Management Branch, Community Services, Government of Yukon (http://www.gov.yk.ca/depts/community/firemanagement/index.html)
Garbutt, Rod, Yukon 2002 Forest Health Report and Yukon 2001 Forest Health Report. Canadian Forest Service, Natural Resources Canada.
Tough, George. April 2002.Yukon Forestry Issues: A Reality Check and a New Direction, for the Minister of DIAND. (http://www.ainc-inac.gc.ca/nr/prs/m-a2002/for_e.html)

Specific:

Figures 4.5.1 and 4.5.2
Source: Forest Management Branch, Energy, Mines & Resources, Government of Yukon

4.6 Land Use - Agriculture

General:

Agriculture Branch, Energy Mines & Resources, Government of Yukon (http://www.emr.gov.yk.ca/Agriculture/default.htm)
Census of Agriculture 2001, Bureau of Statistics, Government of Yukon (http://www.gov.yk.ca/depts/eco/stats/census01/agric.pdf)

Specific:

Figures 4.6.1 and 4.6.2
Source: Census of Agriculture 2001, Bureau of Statistics, Government of Yukon (http://www.gov.yk.ca/depts/eco/stats/census01/agric.pdf)

4.7 Land Use - Tourism

General:

Department of Tourism and Culture, Government of Yukon (http://www.btc.gov.yk.ca/)
Parks and Fish and Wildlife Branches, Department of Environment, Government of Yukon (http://www.environmentyukon.gov.yk.ca/main/index.shtml)
Northern Adventures in ESL Program, Yukon College (http://www.yukoncollege.yk.ca/devstudies/eslnorth.htm)
Yukon Visitor Statistics Year-end Report 2002 and 1999 Visitor Exist Survey and Wilderness Adventure Supplement, Tourism Industry Resource Centre (http://www.tirc.gov.yk.ca/)
Department of Tourism and Culture. Tourism Yukon Product Development Strategy 2003-2005.

Specific:

Figures 4.7.1 to 4.7.3
Source: Department of Tourism and Culture, Government of Yukon

4.8 Land Use - Oil & Gas

General:

Oil and Gas Management Branch, Energy Mines & Resources, Government of Yukon (http://www.emr.gov.yk.ca/Oil_and_Gas/default.htm)
National Energy Board (http://www.neb.gc.ca/)
Geological Survey of Canada (http://www.nrcan.gc.ca/gsc/)

Specific:

Figure 4.8.1 and Table 4.8.1
Data Source: Oil & Gas Management Branch, Energy Mines & Resources, Government of Yukon

Chapter 5 Fish and Wildlife

5.1 Salmon

General:

Yukon Transboundary Area/Fisheries & Oceans Canada (http://www.pac.dfo-mpo.gc.ca/pages/default_e.htm)
Arctic Borderlands Ecological Knowledge Cooperative-Fishing Branch River Chum Return Indicator (http://www.taiga.net/coop/indics/chum.html)

Specific:

Table 5.1.1 and Figures 5.1.1 to 5.1.4
Source: Yukon Transboundary Area/Fisheries & Oceans Canada

5.2 Freshwater Fish

General:

Fish and Wildlife Branch, Department of Environment, Government of Yukon - Hunting, Fishing and Trapping website (http://www.environmentyukon.gov.yk.ca/hunting/index.shtml)

Specific:

Figures 5.2.1, 5.2.2, 5.2.3
Fisheries Management, Fish and Wildlife Branch, Department of Environment, Government of Yukon

5.3 Wildlife Populations & Harvest

5.3.1 Birds

General:

Pacific and Yukon Region, Canadian Wildlife Service, Environment Canada (http://www.pyr.ec.gc.ca/EN/Wildlife/about/index.shtml)
Northern Research Institute, Arts and Science Division, Yukon College (http://www.yukoncollege.yk.ca/programs/nri/)
Fish and Wildlife Branch, Department of Environment, Government of Yukon (http://www.environmentyukon.gov.yk.ca/fishwild/index.shtml)
Parks Branch, Department of Environment, Government of Yukon (http://www.environmentyukon.gov.yk.ca/parks/parks.shtml)

Specific:

Figure 5.3.1.1
Source: Information Management & Technology, Department of Environment, Government of Yukon (note: 2000 data was not included as different survey methods were used)
Figure 5.3.1.2
Source: The Yukon Raptor Population Monitoring Project, Yukon College

1 Diving and Dabbling Duck Populations on Old Crow Flats, Arctic Borderlands Ecological Knowledge Co-op website (http://www.taiga.net/coop/indics/ocduck.html) Note: source of data is from US Fish and Wildlife Service aerial waterfowl survey data.
2 Hawkings, J., Hughes, N., September 17, 2002, Cooperative Roadside Waterfowl Breeding Population Surveys in the southern Yukon Territory. 2002 Report. Canadian Wildlife Service, Environment Canada.

5.3.2 Furbearers

General:

Fish and Wildlife Branch, Department of Environment, Government of Yukon (http://www.environmentyukon.gov.yk.ca/hunting/index.shtml)

Specific:

Tables 5.3.2.1 and 5.3.2.2
Fish and Wildlife Branch, Department of Environment, Government of Yukon
Figure 5.3.2.1
Lynx Data: Fish and Wildlife Branch, Department of Environment, Government of Yukon
Snowshoe Hare Data: Kluane Ecological Monitoring Project (KEMP); Kluane Boreal Forest Ecosystem Project (University of British Columbia, University of Alberta, University of Toronto); Parks Canada, and Environment Yukon.

5.3.3 Caribou

General

Fish and Wildlife Branch, Department of Environment, Government of Yukon (http://www.environmentyukon.gov.yk.ca/fishwild/index.shtml)
Woodland Caribou Management Decision Guidelines - July 1996. Environment, Government of Yukon (http://www.yfwmb.yk.ca/comanagement/species/caribou/guidelines.html)
Porcupine Caribou Herd Size Indicator, Arctic Borderlands Ecological Knowledge Co-op (http://www.taiga.net/coop/indics/pchpop.html)

Specific:

All figures and table
Source: Fish and Wildlife Branch, Department of Environment, Government of Yukon

5.3.4 Moose

General:

Fish and Wildlife Branch, Department of Environment, Government of Yukon (http://www.environmentyukon.gov.yk.ca/fishwild/index.shtml)
Moose Management Guidelines July 1996. Department of Environment, Government of Yukon (http://www.yfwmb.yk.ca/comanagement/species/moose/guidelines.html)

Specific:
Figures 5.3.4.1, 5.3.4.2, 5.3.4.3
Source: Fish and Wildlife Branch, Department of Environment, Government of Yukon

5.3.5 Grizzly Bears

General:
Fish and Wildlife Branch, Department of Environment, Government of Yukon
Grizzly Species Management Guidelines July 1997. Department of Environment, Government of Yukon (http://www.yfwmb.yk.ca/comanagement/species/grizzly/guidelines.html)
Specific:
Figure 5.3.5.1
Source: Fish and Wildlife Branch, Department of Environment, Government of Yukon

5.3.6 Sheep

General:
Fish and Wildlife Branch, Department of Environment, Government of Yukon
Sheep Management Guidelines - July 1996. Department of Environment, Government of Yukon (http://www.yfwmb.yk.ca/comanagement/species/sheep/guidelines.html)
Specific:
Table 5.3.6.1 and 5.3.6.2
Source: Data from Fish and Wildlife Branch, Department of Environment, Government of Yukon

5.3.7 Wildlife Values

General:
Conservation Branch, Protection & Public Education Branch, Government of Yukon
Fish and Wildlife Branch, Department of Environment, Government of Yukon
Parks Branch, Department of Environment, Government of Yukon
Industry Development & Research Branch, Department of Tourism and Culture, Government of Yukon
Wildlife Viewing Website, Department of Environment, Government of Yukon (http://www.environmentyukon.gov.yk.ca/viewing/index.shtml)
Department of Tourism and Culture and the Bureau of Statistics. Yukon Visitor Statistics Year End Report 2002 and Yukon Visitor Exit Surveys.
Tourism Industry Resource Centre, Tourism and Culture, Government of Yukon (http://www.tirc.gov.yk.ca/)
Federal Provincial Task Force on the Importance of Nature to Canadians. 2000. Survey on the Importance of Nature to Canadians: A Federal-Provincial-Territorial Initiative. Environment Canada (http://www.ec.gc.ca/nature/highlights/highlite.html)
Specific:
Figure 5.3.7.1
Source: Fish and Wildlife Branch, Department of Environment, Government of Yukon
Figure 5.3.7.2
Source: Information Management & Technology, Department of Environment, Government of Yukon
Figure 5.3.7.3
Source: Protected Areas Branch, Department of Environment, Government of Yukon

5.4 Species at Risk

General:
Policy Branch, Department of Environment, Government of Yukon
Yukon Species at Risk, Fish and Wildlife Branch, Department of Environment, Government of Yukon website (http://www.environmentyukon.gov.yk.ca/fishwild/specrisk.shtml)
Convention on International Trade in Endangered Species (CITES) website (http://www.cites.org/index.html)
Committee on the Status of Endangered Species in Canada (COSEWIC) website (http://www.cosewic.gc.ca/eng/sct6/index_e.cfm)
Peregrine Falcons in Northern Yukon Indicator, Arctic Borderlands Ecological Knowledge Co-op (http://www.taiga.net/coop/indics/peregrin.html)
Hoefs, Manfred (Editor) 2000. Status of Yukon's Wildlife Report. Fish and Wildlife Branch, Department of Environment, Government of Yukon.
Hawkings, J.S., Breault, A., Boyd S., Norton M., Beyersbergen, G. and Latour P. 2002.Trumpeter Swan Numbers and Distribution in Western Canada, 1970-2000, Canadian Wildlife Service, Environment Canada.
Specific:
Table 5.4.1
Source: Data from Committee on the Status of Endangered Species in Canada (COSEWIC) website (http://www.cosewic.gc.ca/eng/sct6/index_e.cfm)
Table 5.4.2
Source: Data summarized from Status of Yukon's Wildlife Report 2000.
Figures 5.4.1 and 5.4.2
Source: Biodiversity Assessment Monitoring Project, Northern Research Institute, Yukon College

Chapter 6 Ecosystems

6.1 Ecosystems: Wetlands

General:
Fish and Wildlife Branch, Department of Environment, Government of Yukon (http://www.environmentyukon.gov.yk.ca/hunting/index.shtml)
Specific:
Figure 6.1.1
Source: Fish and Wildlife Branch, Department of Environment, Government of Yukon

6.2 Ecosystems: Forests

General:
Forest Management Branch, Energy, Mines & Resources, Government of Yukon (http://www.emr.gov.yk.ca/Forestry/default.htm)
Canadian Forest Service, Pacific Forestry Centre, Natural Resources Canada
Policy & Planning Branch, Energy, Mines & Resources, Government of Yukon
Forest Fire Management Branch, Community Services, Government of Yukon (http://www.gov.yk.ca/depts/community/firemanagement/index.html)
Garbutt, Rod 2002. Yukon 2002 Forest Health Report. Canadian Forest Service, Natural Resources Canada.
Northern Affairs Program, Forest Management Section. 1994. Spruce Beetle Infestation.
Humphreys, N. and L. Safranyik. 1993. Forest Pest Leaflet: Spruce Beetle. Canadian Forest Service, Pacific Forestry Centre.
Unger, L.S. 1995. Forest Pest Leaflet: Spruce Budworms. Canadian Forest Service, Pacific Forestry Centre.
Specific:
Figure 6.2.1
Source: Forest Fire Management Branch, Community Services, Government of Yukon

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Which indicators did you find most useful?

Which indicators not included would you like to see included in a future SOE report?

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